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Sustainable Development of Habitats — Indicators

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FOREWORD

This Indian Standard was adopted by the Bureau of Indian Standards, after the draft finalized by the Smart Cities Sectional Committee had been approved by the Civil Engineering Division Council.

This Indian Standard is designed to assist cities in steering and assessing the performance management of city services and all service provisions as well as quality of life. It considers sustainability as its general principle and resilience and inclusiveness as guiding concepts in the development of cities. All cities, towns and villages can make use of this document for assessment of their current status and development of framework for their sustainable growth.

These indicators are designed keeping variety of habitats in view and are equally applicable for the villages, though the adaptation may require some attention. The term ‘city’ used at places should be deemed to include towns and villages as well.

The core Indicators described in this Indian Standard are considered essential for steering and assessing the performance management of city services and quality of life.

In order to promote best practices, cities should also report on the supporting indicators given in this standard.

The core and supporting indicators are classified into themes according to the different sectors and services provided by a city. The classification structure is used solely to denote the services and area of application of each type of indicator when reported on by a city. This classification has no hierarchical significance and is organized alphabetically according to themes.

Indicators under each theme, where possible, were selected and paired on the basis of input and outcome indicators for further contextual analysis.

Summary table of city indicators is given at Annex A.

When interpreting the results of a particular service area, it is important to review the results of multiple types of indicators across themes; as focus on a single indicator can lead to a distorted or incomplete conclusion. Elements of aspiration of the city must also be taken into consideration in the analysis. For instance, if the city chooses to remain a heritage city, a tourism city, a business city, or an industrial city, such aspiration should be retained and nurtured, while adopting this standard.

Indicators can be used for the city as a whole or for a part of a city, subject to availability of the required data. Indicators can also be aggregated to larger administrative areas (for example region, metropolitan areas, etc). Indicators can be grouped together for analysis when taking into consideration holistic characteristics of a city. Finally, this set of indicators may be complemented by other indicator sets in order to have a more comprehensive and holistic approach to analysis on smartness.

It is also important to acknowledge the potential antagonistic effects of the outcome of particular indicators, either positive or negative, when analyzing results. For example, an increase in air connectivity and the number of automobiles per capita could potentially result in increased levels of particulate matter and greenhouse gas emissions.

For data interpretation purposes, cities shall take into consideration contextual analysis when interpreting results. The local institutional environment may affect the capacity to apply indicators. In some cases, services may be delivered by private sector or the community itself.

The data sources indicated against various indicators in this document are, generally, those operated by national and state level bodies, such as the Registrar General-cum-Census Commissioner of India, Central Statistical Office, National Labour Bureau, National Crime Record Bureau, Central and State Pollution Control Boards, Ministries of Government of India including those of Health and Family Welfare, Housing and Urban Affairs and Human Resources Development and their state counterparts. This standard not only takes into consideration the ISO indicators but also the UN Sustainable Development Goals as also many other relevant national and international documents.

However, while such organizations conduct detailed surveys for collection of data, which at times goes up to household levels, they normally project the analytical results at the national or state levels only, leaving a void

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Indian Standard

SUSTAINABLE DEVELOPMENT OF HABITATS — INDICATORS

1 SCOPE

1.1 This standard defines and establishes methodologies for a set of indicators to steer the development and measure the performance of services and quality of life for sustainable habitats.

1.2 This standard is applicable to a new city or any city, municipality or local body that undertakes to measure its performance in a comparable and verifiable manner, irrespective of size and location. These indicators can be adopted for the rural areas also, with suitable consideration.

NOTE — The words 'habitat' and 'city' have been used interchangeably in this standard.

2 TERMS AND DEFINITIONS

For the purpose of this standard, the terms and definitions given below shall apply.

2.1 Habitat — A human habitation defined by a specific administrative boundary, commonly referred to as a city, town, village, region, etc, or a duly notified part of a city or a village, such as a ward.

NOTE — Depending upon requirements, specific definitions of a town, city, village, etc, can be seen in the relevant legislation of the state or the metadata of Census of India.

2.2 Sustainable Development — The development that meets the needs of the present without compromising the ability of future generations to meet their own needs.

2.3 Indicator — A quantitative, qualitative or descriptive measure.

2.3.1 Indicators in this standard are divided into following:

a) *Core indicators* — Indicators that are required to steer the development and measure the performance in the delivery of services and of quality of life.

b) *Supporting indicators* — Indicators that are recommended to steer the development and measure the performance in the delivery of services and of quality of life.

c) *Profile indicators* — Indicators that provide basic statistics and background information to help peer comparison of habitats. Profile indicators are used as an informative reference.

3 GENERAL

There is a continuous endeavour towards achieving better quality of life of the citizens keeping also in view the challenges from time to time. Services in a habitat provide effective means towards achieving the objective. These services in turn can be guided by a number of indicators directly or indirectly connected to sustainable development and better management of habitats.

The indicators covered in this standard pertain to the following sectors, namely economy, education, energy, environment, finance, governance, health, housing, recreation, safety, sewerage and sanitation, solid waste, telecommunication and innovation, transportation, urban planning, and water supply.

4 ECONOMY

4.1 Gross Domestic Product (GDP) for the City (Core Indicator)

4.1.1 *General*

Gross Domestic Product (GDP) is an indicator of overall production activity and level of economic growth of a village, city, district, state or a country.

4.1.2 *Core Indicator Requirements*

GDP shall be calculated as the sum of gross value added of all resident producer units plus that part of taxes, less subsidies, on products, which is not included in the valuation of output.

4.1.3 *Data Source*

Central Statistical Office (CSO), in the Ministry of Statistics and Programme Implementation (MoSPI), compiles the national and state level GDP, while the district level data is compiled by state Directorates of Economics and Statistics.

As of now, in general, City level GDP is not directly reported, but can be calculated from the methodology outlined in the Urban and Regional Development Plans Formulation and Implementation (URDPFI) Guidelines, 2014 by making use of the state and district level data.

Another data source is the Economic Census (EC), conducted by the CSO through household level surveys every 5 years. As of now, the CSO does not publish the EC data at town, ward, city and village levels. However, unit level data, that is establishment level data with complete identification details of the establishments in terms of their location (like state, district, town, ward, tehsil, village along with enumeration block number) may be available for dissemination by of MoSPI to the data users on request. Based on the EC data, cities can work out their GDP.

NOTE — Computation of GDP is a complex exercise in which data from various sources, such as from various types of organization of the establishments (like corporate sector, government, unincorporated establishments) on output, intermediate consumption, factor incomes, etc, are required for calculation of gross value added by an organization/industry. Information on number of workers in industry as per EC for the domain of interest (like district, city, etc) would be a valuable input for calculation of gross value added (GVA) particularly for unincorporated segment. Number of workers multiplied by GVA per worker for the domain, to be estimated based on a sample survey, would give an estimate of the aggregate GVA for the domain of interest.

4.1.4 *Data Interpretation*

GDP is a measure of level of economic development of the geographical unit (city, district, state, or country) in comparison to other geographical units. It represents the economic significance of a city in relation to the district, state and the country; and also provides a measure for comparing regional disparities.

4.2 GDP per Capita (Core Indicator)

4.2.1 *General*

GDP per capita, is the mean income of the people in an economic unit, such as a country, state, district, or city.

4.2.2 *Core Indicator Requirements*

Per capita income shall be calculated by taking a measure of all sources of income in the aggregate (such as, GDP or Gross National Income) and dividing it by the total population of country, state, district or city.

NOTE — Per capita GDP of a city represents the standard of living of the residents and provides a measure for comparing regional disparities. The city can also analyze the per capita income of intra-city regions, such as wards, to determine intra-city economic disparities and take measures for equalization.

4.2.3 *Data Source*

Central Statistical Office (CSO) in the Ministry of Statistics and Programme Implementation (MoSPI) compiles the data on the national and state level GDP, while the district level data is compiled by state Directorates of Economics and Statistics. Population data is available through the decennial census.

4.3 Gini Coefficient (Supporting Indicator)

4.3.1 *General*

A measure of inequality, Gini coefficient measures the deviation of an income (or consumption) distribution from a perfectly equal distribution among individuals within an economy. It is also known as Gini index or Gini ratio.

4.3.2 *Core Indicator Requirements*

Gini coefficient is obtained from the Lorenz curve, which is a curve that plots the actual relationship between the percentage of income recipients and the percentage of income they actually receive. The cumulative percentage of population is plotted along the horizontal axis while the cumulative percentage of income is plotted along the vertical axis. The 45° line of equality indicates perfect income equality, that is each unit in the economy receives the same income. It may be calculated for the income levels or the consumption expenditure (monthly per capita consumption expenditure). Gini coefficient is obtained by dividing the area between the Lorenz curve and the 45° equality line by the entire area below the 45° line.

NOTE — A Gini coefficient of 0 indicates perfect income equality, while a Gini coefficient of 1 would imply perfect inequality where a single unit possesses all income of the economy.

4.3.3 *Data Source*

See **4.2.3**.

4.4 City's Unemployment Rate (Core Indicator)

4.4.1 *General*

The unemployment rate is considered one of the single, most informative labour market indicators reflecting the general performance of the labour market and the health of the economy as a whole. It is used to measure a city's unutilized labour supply and track business cycles. When economic growth is strong, unemployment rates tend to be low and when the economy is stagnating or in recession, unemployment rates tend to be higher.

4.4.2 *Core Indicator Requirements*

A city's unemployment rate shall be calculated as the number of working-age city residents who during the survey reference period were not in paid employment or self-employment, but available for work, and seeking work (numerator) divided by the total labour force (denominator). The result shall be multiplied by 100 and expressed as a percentage.

Unemployment shall refer to individuals without work, actively seeking work and currently available for work under the Usual Principal Status (UPS) approach. Persons who did not look for work but have a stake in future labour market (arrangements for a future job start) are counted as unemployed. Discouraged workers or hidden unemployed shall refer to persons who are not actively seeking work because they believe the prospects of finding it are extremely poor or they have restricted labour mobility, face discrimination, and/or structural, social, and cultural barriers, are not counted as unemployed or as part of the labour force. Not actively seeking work, shall refer to people who have not taken active steps to seek work (that is job searches, interviews, informational meetings, etc) during a specified recent period (usually the past four weeks).

NOTES

1 Labour force shall refer to the sum of the total persons employed and unemployed who are legally eligible to work and are seeking/available to work.

2 Reference period for employment/unemployment is past four weeks. However, in census, it is one year preceding the date of enumeration.

3 The estimates need to be based on the Usual Principal Status (UPS) approach. The major time criterion based on the last 365 days is used to determine the activity pursued by a person under the UPS approach. Accordingly, the major time spent by a person (183 days or more) is used to determine whether the person is in the labour force or out of the labour force. A person found unemployed under this approach reflects the chronic unemployment. The usual principal activity status estimates are derived based on a moving reference period of last twelve months. For example, if the household is surveyed in January 2019, then the reference period will be January 2018 to December 2018.

4.4.3 *Data Source*

The data of employment-unemployment survey for numeral indicator is available at national as well as state level with Labour Bureau. In some cases; the district level estimates are also available with respective states; where matching sample is collected for reaching out district level estimates of aforesaid indicator. City level data can be obtained from census data, which gives the information on main workers, marginal workers and non-workers along with duration of working in a year, which can be a good approximation to the employment-unemployment status.

4.4.4 *Data Interpretation*

The unemployment rate reflects the portion of the labour force which was available for work during the given reference period but did not get work.

4.5 Assessed Value of Commercial and Industrial Properties as a Percentage of Total Assessed Value of all Properties (Core Indicator)

4.5.1 *General*

Assessed value of commercial and industrial properties as a percentage of total assessed value of all properties provides an understanding of the mix of assessed values of properties as well as the ability of the assessed base. A downward trend in the proportion of commercial and industrial assessed values could indicate an eroding economic base.

4.5.2 *Core Indicator Requirements*

The assessed value of commercial and industrial properties as a percentage of total assessed value of all properties shall be expressed as the assessed value of commercial and industrial properties (numerator) divided by the total assessed value of all properties (denominator). The result shall then be multiplied by 100 and expressed as a percentage.

Commercial and industrial properties shall refer to those, which have been designated by the city for commercial and industrial use.

NOTE — Property assessment methods may vary from one jurisdiction of the country to another, including the market-oriented method, the profit/rent-oriented method and the cost-oriented method.

4.5.3 *Data Source*

The data on above indicator is available from the property assessment records of the municipality/local body of the city/area.

4.6 Number of Businesses per 100 000 Population (Supporting Indicator)

4.6.1 *General*

The number of businesses per 100 000 population indicates a city's level of economic activity and economic performance. It provides one indication of the overall business climate in a jurisdiction, and attitudes towards entrepreneurship. Strong entrepreneurial activity is closely associated with a dynamic and growing economy. The number of businesses is also used to inform competitiveness of a city and reflects both the number of new businesses created and the survival of existing businesses.

4.6.2 *Supporting Indicator Requirements*

The number of businesses per 100 000 population shall be calculated as the total number of businesses in a city (numerator) divided by one 100 000th of the city's total population (denominator). The result shall be expressed as the number of businesses per 100 000 population.

Businesses shall refer to companies or enterprises. The enterprise is the smallest combination of legal unit, that is, an organizational unit producing goods or services. Business can either be categorized as simple (one operating entity) or complex (multiple operating entities).

4.6.3 *Data Source*

a) Number of enterprises at state level can be obtained from the Economic Census conducted by Central Statistical Organization.

b) State-level estimates are available through the NSS survey on Unincorporated Non-agricultural Establishments Excluding Construction.

c) Number of industrial and commercial connections given by the electricity department can give city level data.

d) Number of units registered with District Industries Centre can give city level data.

e) House-listing data of Census (‘Use of Census Houses’) can also give an idea about the number of business units, though in a limited manner.
f) In many cases, the City Municipality also maintains information on businesses operating in the city, for the purposes of licensing and taxation.
g) Number of registered businesses under GST can also be the data source.

5 EDUCATION

5.1 Percentage of Female School-aged Population Enrolled in Schools (Core Indicator)

5.1.1 *General*

Education is one of the most important aspects of human development. This indicator addresses the issue of educational opportunity, by indicating how wide spread formal education is in the city among school-aged population. Reporting on the differential enrolment by gender is consistent with the Sustainable Development Goals (Goal 4 : Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all).

The *Right to Free and Compulsory Education Act,* 2009 provides a justiciable legal framework that entitles all children between the ages of 6 and 14 years to free and compulsory admission, attendance and completion of elementary education. It provides for children’s right to an education that is based on principles of quality, equity and non-discrimination.

5.1.2 *Core Indicator Requirements*

The percentage of female school-aged population enrolled in schools shall be calculated as the number of female school-aged population enrolled at primary and secondary levels in public and private schools (numerator) divided by the total number of female school-aged population (denominator). The result shall then be multiplied by 100 and expressed as a percentage.

NOTE — ‘Enrolment’ is the number of students who were enrolled in a grade as on 30 September of the school year. Information on the status is to be collected from school roster. Enrolment includes new entrants and repeaters for Grade I and new entrants, promotees and repeaters for Grade II onwards.

The proportion of enrolment in public and private schools should be reported, and cities should ensure that private school data are included. In many cities, private schools are a significant component of education in the city.

For details of definition, the Sarva Shiksha Abhiyan Manual for Planning and Appraisal, issued by the Ministry of Human Resource Development (MHRD) may be referred.

5.1.3 *Data Source*

Data on school enrolment is compiled by every state, district and city, under the Unified District Information System of Education (U-DISE) Programme of MHRD. Under U-DISE, the school and village level data is updated annually with 30 September as the reference date. The school/village/city level data comprises variables related to the access to educational facilities of various types, identification of habitation without access to primary and upper primary schools based on distance norms, inventory of all types of educational institutions including recognized and unrecognized schools in the villages, selected data on the number, enrolment and teachers/instructors in non-formal education and alternative schools, pre-primary education including *Anganwadi* and *Balwadi*. Data on age specific population and out of school children generated through household surveys forms part of the village/city data.

5.2 Percentage of Students Completing Primary Education : Survival Rate (Core Indicator)

5.2.1 *General*

Survival rate measures the holding power and internal efficiency of an education system. Survival rate to grade five of primary education is of particular interest since this is commonly considered as a pre-requisite for sustainable literacy. This indicator is often used as an assessment to Millennium Development Goals and continues to be relevant for the Sustainable Development Goals.

5.2.2 *Core Indicator Requirements*

The percentage of students completing primary education or survival rate shall be calculated as the total number of students belonging to a school-cohort who complete the final grade of primary education (numerator) divided by the total number of students belonging to a school-cohort, that is those originally enrolled in the first grade of primary education (denominator). The result shall then be multiplied by 100 and expressed as a percentage. The survival rate of primary education shall be expressed as the percentage of a cohort of students enrolled in the first grade of primary education who reached the final grade of primary education.

Survival rates for the private education sector should be reported, if known. The user of this standard shall note if private school data are included.

Promotees/Passouts : Out of the total enrolment in a grade (say, Grade III) as on 30 September during the base year (say 2018), it is those students who were promoted to the next higher grade (Grade IV) and are on roll as on 30th September of the following year (2019), are classified as promotees.

NOTE — This indicator measures students belonging to a school-cohort who has reached each successive grade of primary education without failing or moving to another jurisdiction.

5.2.3 *Data Source*

Since the calculation of this indicator is based on student flow rates, the reliability of the survival rate depends on the consistency of data on enrolment and repeaters (those who repeat one or more grades) in terms of coverage over time and across grades.

Data on school enrolment is available under the U-DISE Programme of MHRD and can be accessed through the State Education Department and District Education Office.

5.3 Percentage of Students Completing Secondary Education: Survival Rate (Core Indicator)

5.3.1 *General*

Survival rate measures the holding power and internal efficiency of an education system.

5.3.2 *Core Indicator Requirements*

The percentage of students completing secondary education or survival rate shall be calculated as the total number of students belonging to a school-cohort who complete the final grade of secondary education (numerator) divided by the total number of students belonging to a school-cohort, that is those originally enrolled in the first grade of secondary education (denominator). The result shall then be multiplied by 100 and expressed as a percentage. The survival rate of secondary education shall be expressed as the percentage of a cohort of students enrolled in the first grade of secondary education who reached the final grade of secondary education.

Survival rates for the private education sector should be reported, if known. The user of this standard shall note if private school data are included.

NOTES

1 This indicator measures students belonging to a school-cohort who has reached each successive grade of secondary education without failing or moving to another jurisdiction.

2 This methodology is adapted from UNESCO Education Indicator Technical Guidelines and is generally in line with the All India School Education Survey conducted in all the States/Districts by the Ministry of HRD/National Council for Educational Research and Training (NCERT).

*Example***:** If the city reporting year is 2019 and secondary education lasts seven years, report the percentage of students that entered secondary education in 2011 and reached the final grade of secondary education in 2018.

3 Since the calculation of this indicator is based on student-flow rates, the reliability of the survival rate depends on the consistency of data on enrolment and repeaters (those who repeat one or more grades) in terms of coverage over time and across grades.

5.4 Primary Education Student-Teacher Ratio (Core Indicator)

5.4.1 *General*

The student-teacher ratio is an indicator of the adequacy of teacher availability and can be related to the strength and quality of an education system.

5.4.2 *Core Indicator Requirements*

The student-teacher ratio shall be expressed as the number of enrolled primary school students (numerator) divided by the number of full-time equivalent primary school classroom teachers (denominator). The result shall be expressed as the number of students per teacher.

The number of classroom teachers and other instructional staff (for example teachers' aides, guidance counsellors), shall not include administrators or other non-teaching staff. It shall also not include 'Kindergarten' or pre-school teachers and staff.

NOTE — Specific definition of various terms in respect of elementary education is available in the publication titled 'Elementary Education in India-Urban India, National University of Urban Planning and Administration, September 2014'.

5.4.3 *Data Source*

The number of full-time equivalent primary school classroom teachers and the number of enrolled primary school students is available under the U-DISE Programme of MHRD and can be accessed through the State Education Department and District Education Office.

5.4.4 *Data Interpretation*

The student-teacher ratio reflects teacher workload and the availability of teachers' services to their students. The lower the student-teacher ratio, the higher the availability of teacher services to students. The student-teacher ratio has implications not only for the cost of education, but also for the quality. Higher educational attainment is correlated with a lower student-teacher ratio.

5.5 Percentage of School-aged Population Enrolled in Schools (Supporting Indicator)

5.5.1 *General*

Education is one of the most important aspects of human development. This indicator addresses the issue of educational opportunity by indicating how wide spread formal education is in the city among the school-aged population.

5.5.2 *Supporting Indicator Requirements*

The percentage of school-aged population enrolled in schools shall be calculated as the number of school-aged population enrolled in primary and secondary levels in public and private schools (numerator) divided by the total number of the school-aged population (denominator). The result shall then be multiplied by 100 and expressed as a percentage.

Enrolment in public and private schools (recognized by the Central or State Government) should be reported, and cities shall note in the comment section if private school data are included. In some cities, private schools area significant component of education in the city. Enrolment in religious schools and home schools should be included, if they are recognized.

Part-time enrolment of a half-day or more shall be counted as a full-time enrolment.

5.5.3 *Data Source*

Data on school enrolment is compiled by every state, district and city, under the Unified District Information System of Education (U-DISE) Programme of the Ministry of Human Resources Development (MHRD). Under U-DISE, the school and village level data is updated annually with 30 September as the reference date. The school/village/city level data comprises variables related to the access to educational facilities of various types, identification of habitation without access to primary and upper primary schools based on distance norms, inventory of all types of educational institutions including recognized and unrecognized schools in the village, selected data on the number, enrolment and teachers/instructors in non-formal education and alternative schools, pre-primary education including *Anganwadis* and *Balwadis*. Data on age specific population and out of school children generated through household surveys forms part of the village/city data.

6 ENERGY

6.1 Percentage of Total Energy Derived from Renewable Sources, as a Share of the City's Total Energy Consumption (Core Indicator)

6.1.1 *General*

Promotion of renewable energy sources is a high priority for sustainable development, for reasons, such as the security and diversification of energy supply and for environmental protection.

6.1.2 *Core Indicator Requirements*

The share of a city's total energy consumption derived from renewable sources shall be calculated as the total consumption of electricity generated from renewable sources (numerator) divided by total energy consumption (denominator). The result shall then be multiplied by 100 and expressed as a percentage. Consumption of renewable sources, including the energy from fuel cell, should include geothermal, solar, wind, hydro, tide and wave energy, and combustibles, such as biomass.

6.1.3 *Data Source*

Data should be available from local utility provider, city energy or environment office.

6.1.4 *Data Interpretation*

Renewable energy shall include both combustible and non-combustible renewables. Non-combustible renewables include geothermal, solar, wind, hydro, tide and wave energy. For geothermal energy, the energy quantity is the enthalpy of the geothermal heat entering the process. For solar, wind, hydro, tide and wave energy, the quantities entering electricity generation are equal to the electrical energy generated. The combustible renewables and waste (CRW) consist of biomass (fuel wood, vegetal waste, ethanol) and animal products (animal materials/waste and sulphite lyes), municipal waste (waste produced by the residential, commercial and public service sectors that are collected by local authorities for disposal in a central location for the production of heat and/or power) and industrial waste.

NOTE — The data on breakdown of energy consumption by source (that is, energy derived from fossil fuel; derived from nuclear; derived from renewable, etc, in percent), if available, should be noted.

6.2 Total Electrical Energy Use per Capita (kWh/Year) (Core Indicator)

6.2.1 *General*

An understanding of how much electricity is currently being consumed is needed in order to effectively manage generation, consumption, and conservation of electricity. Electricity is used to produce goods and services that are needed for economic growth and improved quality of life. Total electrical consumption reflects the overall consumption used by commercial, industrial, and residential sectors

6.2.2 *Core Indicator Requirements*

Total electrical energy use per capita shall be calculated as the total electrical usage of a city in kilowatt-hours including residential and non-residential use (numerator) divided by the total population of the city (denominator). The result shall be expressed as the total electrical energy use per capita in kilowatt hour/year.

6.2.3 *Data Source*

Data shall be gathered from electricity providers. Electricity consumption statistics are typically collected in three categories: residential, commercial and industrial.

NOTE — Electricity providers typically report electricity consumption statistics by customer and not by resident or they report consumption by sector (residential, commercial and industrial) in bulk and then report more detailed statistics as averages.

6.2.4 *Data Interpretation*

Compilation of the sources used to generate energy based on fossil and renewable energy sources, types of renewable energy already in use, identification of locally existing renewable energy sources, compilation of the energy required for heating and cooling processes, and completed and planned measures to save energy and to improve energy efficiency, and completed and planned activities for the environment friendly insulation and cooling of buildings, if available should be noted.

6.3 Total Residential Electrical Energy Use Per Capita (kWh/Year) (Supporting Indicator)

6.3.1 *General*

An understanding of how much electricity is currently being consumed is needed in order to effectively manage generation, consumption, and conservation of electricity. Residential areas are one of the major consumers of electricity and its associated resource use.

6.3.2 *Supporting Indicator Requirements*

Total residential electrical energy use per capita shall be calculated as the total residential electrical usage of a city in kilowatt hour (numerator) divided by the total population of the city (denominator). The result shall be expressed as the total residential electrical energy use per capita in kilowatt hour/year.

6.3.3 *Data Source*

Data should be gathered from electricity providers. Electricity consumption statistics are typically collected in three categories, residential, commercial and industrial.

NOTE — Electricity providers typically report electricity consumption statistics by customer and not by resident or they report consumption by sector (residential, commercial and industrial) in bulk and then report more detailed statistics as averages.

6.4 Average Number of Electrical Interruptions per Customer per Year (Supporting Indicator)

6.4.1 *General*

Average number of electrical interruptions helps to track and benchmark reliability performance in electric utility services.

6.4.2 *Supporting Indicator Requirements*

The average number of electrical interruptions per customer per year shall be calculated as the total number of customer interruptions (numerator) divided by the total number of customers served (denominator). The result shall be expressed as the average number of electrical interruptions per customer per year.

Electrical interruptions shall include both residential and non-residential.

It is normal to expect interruptions in service for a number of reasons including scheduled maintenance and equipment breakdown. To establish the opportunity to have a reasonable comparison between energy providers, major storms and weather events should be excluded due to their unpredictability and randomness since they are difficult to predict, prevent or mitigate against.

6.4.3 *Data Source*

Data shall be gathered from electricity providers.

NOTE — This indicator is affected by the age, standard of maintenance and reliability of the infrastructure that constitutes the electricity grid and the electricity transmission capacity that services the grid. The ability of both the grid and its electricity transmission capacity to provide supply on demand and to cope with peak load is also an important consideration.

6.5 Average Length of Electrical Interruptions (in Hours) (Supporting Indicator)

6.5.1 *General*

Average length of electrical interruptions helps to track and benchmark reliability performance in electric utility services.

6.5.2 *Supporting Indicator Requirements*

The average length of electrical interruptions shall be calculated as the sum of the duration of all customer interruptions, in hours (numerator) divided by the total number of customer interruptions (denominator). The result shall be expressed as the average length of electrical interruptions in hours.

Electrical Interruptions shall include both residential and non-residential.

It is normal to expect interruptions in service for a number of reasons including scheduled maintenance and equipment break down. To establish the opportunity to have a reasonable comparison between energy providers, major storms and weather events shall be excluded due to their unpredictability as they are difficult to prevent or mitigate against.

6.5.3 *Data Source*

Data shall be gathered from electricity providers.

NOTE — This indicator is affected by the age, standard of maintenance and reliability of the infrastructure that constitutes the electricity grid and the electricity transmission capacity that services the grid. The ability of both the grid and its electricity transmission capacity to provide supply on demand and to cope with peak loads is also an important consideration.

6.6 Percentage of Transmission and Distribution (T&D) Losses (Supporting Indicator)

6.6.1 *General*

Energy losses occur in the process of supplying electricity to consumers due to technical and commercial reasons. The technical losses are due to energy dissipated in the conductors, transformers and other equipment used for transmission, transformation, sub-transmission and distribution of power. These technical losses are inherent in a system and can be reduced to a certain level.

Pilferage by hooking, bypassing meters, defective meters, errors in meter reading and in estimating un-metered supply of energy are the main sources of the commercial losses. When commercial losses are added to the technical losses, it gives Transmission and Distribution (T&D) loss.

There is another component of commercial losses, which is attributable to non-recovery of the billed amount, which is reflected in collection efficiency. T&D losses together with loss in collection give us the Aggregate Technical and Commercial (AT&C) losses.

6.6.2 *Supporting Indicator Requirements*

The methodologies for computation of T&D losses and AT&C losses are as follows:

a) *Transmission and distribution losses (T&D losses):*

$$\text{T\&D Losses} = \left(1 - \frac{\text{Total energy billed}}{\text{Total energy input in the system}}\right) \times 100$$

b) *Aggregate technical and commercial losses (AT&C losses):*

$$\text{AT\&C Losses} = (1 - \text{Billing efficiency} \times \text{Collection efficiency}) \times 100$$

where

$$\text{Billing efficiency} = \frac{\text{Total unit billed}}{\text{Total unit input}}$$

$$\text{Collection efficiency} = \frac{\text{Revenue collected}}{\text{Amount billed}}$$

Ideally, reduction of technical losses should be the parameter for evaluation of performance of distribution companies (DISCOMs). However, the technical losses of the DISCOMs are not available and also it involves a cumbersome process to calculate the technical losses, which varies based on various factors like loading pattern, etc. Now, only the T&D losses and AT&C losses are available as the performance parameter for achieving energy efficiency by DISCOMs. Out of the two parameters, T&D loss parameter seems to be appropriate parameter, which reflects energy savings to a greater extent as compared to AT&C losses.

6.6.3 *Data Source*

Information on the T&D losses for the city is available with the respective DISCOMs, who also maintain the data for disaggregated levels within a city, such as wards, zones, etc. The periodicity of publication of the information is usually monthly.

7 ENVIRONMENT

7.1 Fine Particulate Matter ($PM_{2.5}$) Concentration (Core Indicator)

7.1.1 *General*

Fine particulate matter can cause major health problems in cities. The concentration of particulate matter (PM) is harmful to human health. PM is carcinogenic and harms the circulatory system as well as the respiratory system. Although all PMs are not carcinogenic, some sources are classified as human carcinogen and harmful to human being. One of the evidence of PM and its public health impact is consistent in showing adverse health effects at exposures that are currently experienced by urban populations in both developed and developing countries. The range of health effects is broad, but is predominantly to the respiratory and cardiovascular systems.

7.1.2 *Core Indicator Requirements*

Fine particulate matter ($PM_{2.5}$) concentration shall be calculated as the total mass of collected particles that are 2.5 microns or less in diameter (numerator) divided by the volume of air sampled (denominator). The result shall be expressed as the concentration of $PM_{2.5}$ in micrograms per cubic meter ($\mu g/m^3$).

The method for measurement shall involve the use of an air sampler, which draws ambient air at a constant flow rate into a specially shaped inlet where the suspended particulate matter is initially separated into one or more size fractions within the $PM_{2.5}$ size range. The 24 hourly (daily) measurements of $PM_{2.5}$ concentrations are computed and data is 24 hourly and annually compiled for each monitoring stations.

7.1.3 *Data Source*

The Central Pollution Control Board (CPCB) is executing a nation-wide programme of ambient air quality monitoring known as National Air Quality Monitoring Programme (NAMP). The network consists of 621 operating stations covering 262 cities/towns in 29 States and 5 Union Territories as on date and the coverage is expanding.

The objectives of the NAMP are to determine the status and trends of ambient air quality; to ascertain whether the prescribed ambient air quality standards are violated; to identify non-attainment cities; to obtain the knowledge and understanding necessary for developing preventive and corrective measures and to understand the natural cleansing process undergoing in the environment through pollution dilution, dispersion, wind based movement, dry deposition, precipitation and chemical transformation of pollutants generated.

Under NAMP, three air pollutants, namely sulphur dioxide (SO_2), nitrogen dioxide (NO_2), and respirable suspended particulate matter (PM_{10}) have been identified for regular monitoring at all the locations. The monitoring of meteorological parameters, such as wind speed and wind direction, relative humidity (RH) and temperature are also targeted to be included in the monitoring of air quality.

7.2 Particulate Matter (PM_{10}) Concentration (Core Indicator)

7.2.1 *General*

The evidence on airborne Particulate Matter (PM) and its public health impact is consistent in showing adverse health effects at exposures that are currently experienced by urban populations in both developed and developing countries. PM pose a health concern because they can be inhaled into and accumulate in the respiratory system. People with heart or lung disease, older adults, and children are considered at greater risk to particle pollution. Long-term exposures (annual mean) to particles, such as those experienced by people living for many years in areas with high particle levels, have been associated with problems, such as reduced lung function and the development of chronic bronchitis and even premature death. Short-term exposures (24 h) to particles can aggravate lung diseases, causing asthma attacks and acute bronchitis, and may also increase susceptibility to respiratory infections.

7.2.2 *Core Indicator Requirements*

Particulate Matter (PM_{10}) concentration shall be calculated as the total mass of collected particles in the PM_{10} size range (numerator) divided by the volume of air sampled (denominator). The result shall be expressed as the concentration of PM_{10} in micrograms per cubic metre (µg/m^3).

The method for measurement shall involve the use of an air sampler which draws ambient air at a constant flow rate (1m^3/min) into a specially shaped inlet where the suspended particulate matter is initially separated less than or equal of PM_{10} size range. The 24 hourly (daily) measurements of PM_{10} concentrations are computed and data is 24 hourly and annually compiled for each monitoring stations.

NOTE — Particulate matter is a mixture of microscopic solids and liquid droplets suspended in air. These particulates are made up of a number of components, including acids (such as nitrates and sulphates), organic chemicals, metals, soil or dust particles, and allergens (such as fragments of pollen or mould spores). Coarse particles are greater than 2.5 microns and less or equal to 10 microns in diameter and are defined as 'respirable particulate matter' or PM_{10}. Sources of coarse particles include crushing or grinding operations, and dust from paved or unpaved roads.

7.2.3 *Data Source*

See **7.1.3**.

7.3 Nitrogen Dioxide (NO_2) Concentration (Supporting Indicator)

7.3.1 *General*

Nitrogen dioxide (NO_2) is a major air pollutant, which can have significant impacts on human health and the environment. NO_2 contributes to the formation of photochemical smog and at raised levels can increase the likelihood of respiratory problems. Nitrogen dioxide inflames the lining of the lungs, and it can reduce immunity to lung infections. This can cause problems such as wheezing, coughing, colds, flu and bronchitis. Increased levels of nitrogen dioxide can have significant impacts on people with asthma because it can cause more frequent and more intense attacks. NO_2 chemically transforms into nitric acid and contributes to acid rain. Nitric acid can corrode metals, fade fabrics, and degrade rubber. When deposited, it can also contribute to lake acidification and can damage trees and crops, resulting in substantial losses.

7.3.2 *Supporting Indicator Requirements*

NO_2 concentration shall be calculated as the sum of daily concentrations for whole year (numerator) divided by 365 days (denominator). The result shall be expressed as the annual average for daily NO_2 concentration, in µg/m^3. The daily concentrations shall be determined by averaging the hourly/4 hourly concentrations throughout a 24 h period from all monitoring stations within the city.

The method for measurement shall involve the use of an air sampler, which draws ambient air at a constant flow rate (1m^3/min) into especially designed gaseous attachment or inlet where the nitrogen dioxide is absorbed initially and analyzed in the laboratory. The 1 hourly/4 hourly measurements or 24 hourly (daily) measurements of NO_2 concentrations are computed and data is 24 hourly and annually compiled for each monitoring stations.

7.3.3 *Data Source*

See **7.1.3**.

7.4 Sulphur Dioxide (SO_2) Concentration (Supporting Indicator)

7.4.1 *General*

Sulphur dioxide (SO_2) is a major air pollutant, which can have significant impacts on human health and the environment. Health effects caused by exposure to high levels of SO_2 include breathing problems, respiratory illness, changes in the lung's defenses, and worsening respiratory and cardiovascular disease. People with asthma or chronic lung or heart disease are the most sensitive to SO_2. It also damages trees and crops. SO_2, along with nitrogen oxides, are the main precursors of acid rain. This contributes to the acidification of lakes and streams, accelerated corrosion of buildings, reduced visibility and deforestation. SO_2 also causes formation of microscopic acid aerosols, which have serious health implications as well as contributing to climate change.

7.4.2 *Supporting Indicator Requirements*

Sulphur dioxide concentration shall be calculated as the sum of daily concentrations for the whole year (numerator) divided by 365 days. The result shall be expressed as the annual average for daily SO_2 concentration, in µg/m^3. The daily concentration shall be determined by averaging the hourly/four hourly concentrations throughout a 24 h period from all monitoring stations within the city.

The method for measurement shall involve the use of an air sampler, which draws ambient air at a constant flow rate (1m^3/min) into especially designed gaseous attachment or inlet where the SO_2 is absorbed initially and analyzed in the laboratory. The 1 hourly/4 hourly measurements or 24 hourly (daily) measurements of SO_2 concentrations are computed and data is 24 hourly and annually compiled for each monitoring stations.

7.4.3 *Data Source*

See **7.1.3**.

7.5 Ozone (O_3) Concentration (Supporting Indicator)

7.5.1 *General*

High concentrations of ozone (O_3) in the ambient air are harmful for humans as well as plants. High concentrations of ozone can irritate the respiratory system and are linked to asthma, bronchitis and heart attacks. The elderly are especially vulnerable.

NOTE — There are links being made to ozone concentration and environmental justice, in particular with reference to underprivileged social groups with higher exposure and vulnerability.

7.5.2 *Supporting Indicator Requirements*

Ozone (O_3) concentration shall be calculated as the sum of daily concentrations for the whole year (numerator) divided by 365 days (denominator). The result shall be expressed as the annual average for daily O_3 concentration in µg/m^3. O_3 is normally monitored at 8 h intervals. To determine the 24 h average daily concentration, the three 8 hourly concentrations shall be determined and averaged over a 24 h period at all monitoring stations within the city's boundaries.

7.5.3 *Data Source*

See **7.1.3**.

7.6 Green House Gas Emissions Measured in Tonnes per Capita (Core Indicator)

7.6.1 *General*

The greenhouse gas (GHG) emissions from all activities within the city are an indicator of the adverse contribution the city is making to climate change. Gases that trap heat in the atmosphere are called greenhouse gases. The most abundant GHG in Earth's atmosphere are: (a) Water vapour (H_2O), (b) Carbon dioxide (CO_2), (c) Methane (CH_4), (d) Nitrous oxide (N_2O), (e) Ozone (O_3), and (f) Chloro-fluorocarbons (CFCs). The major sources of Greenhouse Gases (GHG) are as follows:

a) *Carbon Dioxide (CO_2)* — Carbon dioxide enters the atmosphere through burning fossil fuels (coal, natural gas and oil), solid waste, wood, and also as a result of certain chemical reactions and industrial processes (for example, manufacture of cement). Carbon dioxide is removed from the atmosphere (or 'sequestered') when it is absorbed by plants as part of the biological carbon cycle.

b) *Methane (CH_4)* — Methane is emitted during the production and transport of coal, natural gas, and oil. Methane emissions also result from livestock and other agricultural practices and by the decay of organic waste in municipal solid waste landfills.

c) *Nitrous Oxide (N_2O)* — Nitrous oxide is emitted during agricultural and industrial activities, as well as during combustion of fossil fuels and solid waste.

d) *Fluorinated Gases* — Hydrofluorocarbons (HFC), perfluorocarbons, sulphur hexafluoride, and nitrogen tri-fluoride are synthetic, powerful greenhouse gases that are emitted from a variety of industrial processes. Fluorinated gases are sometimes used as substitutes for stratospheric ozone-depleting substances (for example, chlorofluorocarbons, HFCs, and halons). These gases are typically emitted in smaller quantities, but because they are potent greenhouse gases, they are sometimes referred to as High Global Warming Potential gases (High GWP gases).

7.6.2 *Core Indicator Requirements*

The greenhouse gas emissions measured in tonnes per capita shall be measured as the total amount of greenhouse gases in tonnes (equivalent carbon dioxide units) generated over a calendar year by all activities within the city, including indirect emissions outside city boundaries (numerator) divided by the current city population (denominator). The result shall be expressed as the total greenhouse gas emissions per capita in tonnes.

The total aggregate tonnage (expressed as equivalent carbon dioxide units of greenhouse gas) of greenhouse gas emissions shall be calculated for all activities within the city for the preceding 12 months.

The Global Protocol for Community-Scale GHG Emissions (GPC), (2012 Accounting and Reporting Standard) refers to a multi-stakeholder consensus-based protocol for developing international recognized and accepted community-scale greenhouse gas accounting and reporting. This protocol defines the basic emissions sources and categories within sectors for a community-scale GHG inventory, in order to standardize GHG inventories between communities and within a community over time. The protocol provides accounting methodologies and step-by-step guidance on data collection, quantification, and reporting recommendations for each source of emissions.

Both emissions sources and sector categorizations reflect the unique nature of cities and their primary emissions sources. These include emissions from: (a) Stationary units, (b) Mobile units, (c) Waste, and (d) Industrial process and product use sectors. For further specifications, refer to the full GPC methodology. Local bodies are expected to provide information (that is quantified emissions) for each of these emission sources.

In order to address the issue of inter-city sources of emissions that transcend more than one jurisdictional body, the GPC integrates the GHG protocol scope definitions, as follows:

a) *Scope* 2 *emissions* — Energy-related indirect emissions that result as a consequence of consumption of grid-supplied electricity, heating and/or cooling, within the community's geopolitical boundary.
b) *Scope* 3 *emissions* — All other indirect emissions that occur as a result of activities within the community's geopolitical boundary.

For step-by-step guidance on data and accounting collection, *see* section 3 of the GPC.

NOTE — Greenhouse gases (GHGs) are gases in the atmosphere that absorb infrared radiation that would otherwise escape to space; thereby contributing to rising surface temperatures. There are six major GHGs: carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulphur hexafluoride (SF_6). The warming potential for these gases varies from several years to decades to centuries.

Users may also consult the ISO 14064 series of standards on *greenhouse gases* for further guidance.

7.6.3 *Data Source*

See MOEF&CC website to get the data under National Programme on Climate Change & India's Initial National Communication (NATCOM).

7.7 Air Quality Index (Core Indicator)

7.7.1 *General*

Air Quality Index (AQI) is a tool for effective communication of air quality status in terms, which are easy to understand. It transforms complex air quality data of various pollutants into a single number (index value), nomenclature and colour.

7.7.2 *Supporting Indicator Requirements*

AQI is based on sub-index and health breakpoints evolved for eight pollutants (PM_{10}, $PM_{2.5}$, NO_2, SO_2, CO, O_3, NH_3 and Pb). Based on the measured ambient concentrations of a pollutant, sub-index is calculated, which is a linear function of concentration (for example, the sub-index for $PM_{2.5}$ is 51 at concentration 31 µg/m^3, 100 at concentration 60 µg/m^3, and 75 at concentration of 45 µg/m^3). The worst sub-index determines the overall AQI. AQI is calculated only if data are available for minimum three pollutants out of which one should necessarily be either $PM_{2.5}$ or PM_{10}

7.7.3 *Data Sources*

See **7.1.3**.

7.8 Noise Pollution (Core Indicator)

7.8.1 *General*

Prolonged exposure to ambient noise from various sources, such as industrial activity, construction activity, fire crackers, sound producing instruments, generator sets, loud speakers, public address systems, music systems, vehicular horns and other mechanical devices have deleterious effects on human health and the psychological well being of the people. To regulate noise pollution, specific provisions have been made under the *Noise Pollution (Regulation and Control) Rules*, 2000.

NOTE — Another useful indicator of the noise levels in a city is the degree of annoyance as specified in ISO/TS 15666 : 2003 'Acoustics – Assessment of noise annoyance by means of social and socio-acoustic surveys'.

7.8.2 *Core Indicator Requirements*

Noise pollution shall be calculated by mapping the noise level, *L* (day-evening-night) likely to cause annoyance as given in ISO 1996-2 : 2017 'Acoustics — Description and measurement of environmental noise — Part 2: Acquisition of data pertinent to land use' identifying the areas of the city where *L* is greater than 55 dB(A) and estimating the population of those areas as a percentage of the total city population. The result shall be expressed as the percentage of the population affected by noise pollution.

Users of this standard should note that noise pollution can also be recorded as *L* (night) and when exceeding 50 dB(A) is likely to cause sleep deprivation.

The *Noise Pollution (Regulation and Control) Rules*, 2000 defines the upper limits for noise pollution in the ambient air. The State Government, local bodies and other authorities are notified for enforcing these standards.

7.8.3 *Data Source*

Average concentrations are measured by monitoring equipment and reported to air quality monitoring authority (that is city environment office, national/ state environment office, etc), notified by the states under the *Noise Pollution (Regulation and Control) Rules*, 2000.

7.9 Quality of Public Water Bodies (Core Indicator)

7.9.1 *General*

This indicator aims at determining the quality of water of public sources, such as rivers, lakes, ponds and sub-soil water bodies in the city. Water pollution is an increasing concern as water is a scarce resource and hence measuring and keeping a check on water quality becomes important so that the water health is maintained for intended purposes including for propagation of wild life and fisheries.

7.9.2 *Core Indicator Requirements*

The water quality monitoring network needs to be established with the help of central and state pollution control boards which covers ground waters and surface water encompassing rivers, lakes, tanks, ponds, creeks/ sea water, canals, drains, water treatment plants and wells.

The Central Pollution Control Board has defined the standards for water quality for variety of purposes including for drinking, outdoor bathing, propagation of wild life and fisheries and controlled disposal. It has developed water quality index for the purpose.

7.9.3 *Data Source*

Central and state pollution control boards and committees have set up water quality monitoring stations at various locations. Cities can take the help of these organizations to undertake monitoring of water quality of the city water bodies.

NOTE — At times, specialized agencies are created to look after the city water bodies.

8 FINANCE

8.1 Debt Service Ratio (Debt Service Expenditure as a Percentage of Municipality's Own-Source Revenue) (Core Indicator)

8.1.1 *General*

This indicator is widely accepted as a measure of sound financial management and reflects the amount of financial resources that are available for day-to-day operations and how much money is spent paying down debt. It can be a controllable cost and can assist in priority setting.

8.1.2 *Core Indicator Requirements*

Debt service ratio is the ratio of debt service expenditure as percent of a municipality's own source revenue. Debt service ratio shall be calculated as the total long-term debt servicing costs including lease payments, temporary financing and other debt charges (numerator) divided by total own-source revenue (denominator). The result shall then be multiplied by 100 and expressed as a percentage of debt service expenditure as a percent of a municipality's own-source revenue.

Total own source revenue shall be calculated as the total revenue less transfers.

8.1.3 *Data Source*

The annual budget of the municipality would provide information on the outstanding debt liability and the provisions made/required for debt-servicing. The information can be cross-verified with the annual audit reports.

8.1.4 *Data Interpretation*

A lower number may indicate either an increased ability to borrow or a decision by a municipality to limit its debt to enable funding of other service areas.

Care must be used in evaluating this indicator. A high debt-service ratio may indicate a municipality that has taken on too much debt but it may also indicate that the municipality has taken an aggressive approach to debt repayment and is paying down their debt quickly. Similarly, a low debt service ratio could indicate a municipality is strong financially and can finance most capital projects through alternative funding sources. It may also indicate that a municipality is financially weaker and has deferred capital projects and allowed important infrastructure to deteriorate.

8.2 Capital Spending as a Percentage of Total Expenditure (Supporting Indicator)

8.2.1 *General*

The amount of capital expenditure by the city expressed as a percentage of the total city expenditure is an indicator of capital re-investment and the fiscal health of the city.

8.2.2 *Supporting Indicator Requirements*

The capital spending as a percentage of total expenditures shall be calculated as the total expenditure on fixed assets in the preceding year (numerator) divided by the total expenditure (operating and capital) (denominator) by the city in the same period. The result shall then be multiplied by 100 and expressed as a percentage of capital spending as a percent of total expenditure.

NOTE — Fixed assets are not expected to be consumed or converted into cash in the normal course of business. These are long-term, more permanent or 'fixed' items, such as land, building, equipment, fixtures, furniture, and leasehold improvements.

8.2.3 *Data Source*

The figures used in this calculation should be taken directly from the city's annual budget and the audited financial statements.

8.2.4 *Data Interpretation*

This indicator needs to be considered in conjunction with the debt service ratio indicator to obtain an understanding of the city's capacity to maintain its capital expenditure. The level of capital expenditure in relation to recurrent expenditure may reflect the city's financial capacity to invest in capital items needed to support future growth and development.

8.3 Own-Source Revenue as a Percentage of Total Revenues (Supporting Indicator)

8.3.1 *General*

On a very basic level, this indicator measures the level of dependence of the city on other levels of government for revenues to deliver its services to the public.

8.3.2 *Supporting Indicator Requirements*

Own-source revenue as a percentage of total revenues shall be calculated as the total amount of funds obtained through permit fees, user charges for city services, and taxes collected for city purposes only (numerator), divided by all operating or re-occurring revenues including those provided by other levels of government transferred to the city (denominator). The result shall then be multiplied by 100 and expressed as a percentage.

Own-source revenue as a percentage of total revenues represent the percentage of local government revenues originating from fees, charges and taxes as permitted by law or legislation in relation to all revenues including those provided by other levels of government, which includes operating or re-occurring revenues determined through methods, such as formula driven payments or repatriation of income tax, grant donations from higher government levels including national or state governments and other types of financial transfers that may be tied to the delivery of specific services.

8.3.3 *Data Source*

See **8.2.3**.

8.4 Tax Collected as a Percentage of Tax Billed (Supporting Indicator)

8.4.1 *General*

Tax collection is a major source of income for all levels of government including cities. This indicator is intended to measure the effectiveness of a city's financial management capabilities and to some extent is a proxy of the willingness of citizens to pay taxes.

8.4.2 *Supporting Indicator Requirements*

The tax collected as a percentage of tax billed measures the ratio of the actual tax collected to the mandated tax. It shall be calculated as the total revenues generated by tax collection (numerator) divided by the amount of taxes billed (denominator). The result shall then be multiplied by 100 and expressed as a percentage.

8.4.3 *Data Source*

See **8.2.3**.

9 GOVERNANCE

9.1 Voter Participation in Last Municipal Election (as a Percentage of Eligible Voters) (Core Indicator)

9.1.1 *General*

The percentage of the eligible voting population that voted in the last municipal election is an indicator of the public's level of participation and degree of interest in local government.

9.1.2 *Core Indicator Requirements*

The voter participation in the last municipal election shall be calculated as the number of persons that voted in the last municipal election (numerator) divided by the city population eligible to vote (denominator). The result shall then be multiplied by 100 and expressed as a percentage.

A result of zero shall be indicated if there have been no municipal elections in the last five years and this shall be noted in the comments.

NOTES

1 Election laws have provided for 'None of the above (NOTA) option also, for a voter who does not wish to vote for any of the candidates listed on the ballot paper. Ratio of the voters who opted for the NOTA option, to the total number of voters who cast their votes (including the number of invalid votes) would give an indication of satisfaction of the citizens with the governance framework at the electoral levels.

2 There is a distinction between eligible to vote and registered to vote. This should be noted.

9.1.3 *Data Source*

Information should be obtained from the local election authorities.

9.1.4 *Data Interpretation*

This indicator will only reveal the level of participation, not the level of satisfaction of the population. In some cases, high rates of participation will mean that the population is not satisfied with its local government's leadership and actions.

9.2 Women as a Percentage of Total Elected to City Level Offices (Core Indicator)

9.2.1 *General*

The percentage of women elected to city level office is a direct reflection of inclusiveness in governance.

9.2.2 *Core Indicator Requirements*

The number of women elected to city level office shall be calculated as the total number of elected city level positions held by women (numerator) divided by the total number of elected city level positions (denominator). The result shall then be multiplied by 100 and expressed as a percentage.

The number of elected city level positions shall refer to the number of places on the city council or in city government that are directly or indirectly elected. This shall include elected managerial roles, such as Council/Standing Committee chairperson, where relevant.

NOTE — While there is a constitutional mandate to ensure a minimum of one-third of the seats to be reserved for women in the offices of chairperson of municipalities, some states have made provisions to provide higher percentage for women. In some cities, the percentage of women elected representatives is even higher than the statutory requirements.

9.2.3 *Data Source*

See **9.1.3**.

9.3 Percentage of Women Employed in the City Government Workforce (Supporting Indicator)

9.3.1 *General*

The percentage of the city government workforce that is women is a direct reflection of the equity of the hiring system within the city government.

9.3.2 *Supporting Indicator Requirements*

The number of women employed in the city government workforce shall be calculated as the total number of employees in the city government workforce that are women (numerator) divided by the total number of the city government workforce (denominator). The result shall then be multiplied by 100 and expressed as a percentage.

The city government workforce shall be calculated as the total number of employees working within the city government.

9.3.3 *Data Source*

Information should be obtained from the city government offices.

9.4 Number of Convictions for Corruption by City Officials per 100 000 Population (Supporting Indicator)

9.4.1 *General*

The principles of governance include selflessness, objectivity, accountability, openness, honesty and leadership. The number of convictions for corruption/bribery can reflect the extent to which governance adheres to these core principles.

9.4.2 *Supporting Indicator Requirements*

The number of convictions for corruption by city officials shall be calculated as the total number of convictions for corruption by city officials (numerator) divided by one 100 000th of the city's total population (denominator).

City officials are the elected representatives or employed officials of the municipality.

9.4.3 *Data Source*

Information should be obtained from the city government office.

9.5 Citizens' Representation: Number of Local Official Elected to Office per 100 000 Population (Supporting Indicator)

9.5.1 *General*

The number of public officials elected by citizens of the city and the right of citizens as guaranteed by law, to examine and then make submissions/objections to urban planning, development and infrastructure policies/plans/projects prior to their approval/construction is an indicator of citizens' rights to participate in the affairs of their city.

9.5.2 *Supporting Indicator Requirements*

The number of local officials elected to office per 100 000 shall be calculated as the total number of public officials elected to local office by citizens of the city (numerator) divided by one 100 000th of the city's total population (denominator). The result shall be expressed as the number of local officials elected to office per 100 000 population.

The term 'public officials elected to local office by citizens of the city' shall include all positions in the public service relating to the city that require election by the citizens of the city to hold office. It includes all councils, boards, commissions, etc. where members are elected by the citizens of the city but does not include national or state government politicians.

NOTE — This indicator only reveals the number of local officials elected to office and does not determine whether or not citizens have the right, guaranteed by law, to examine and then make submissions/ objections to urban planning, development and infrastructure policies/plans/projects prior to their approval/construction. It is codified and enforceable law of the city that guarantees citizens the right to examine and then make submissions/objections to urban planning, development and infrastructure policies/plans/projects prior to their approval/construction in order for cities to report that this element of the citizens' participation exists in their city. Whether these rights exist should be noted.

9.5.3 *Data Source*

See **9.1.3**.

9.5.4 *Comments and Limitations*

An increase in the number of elected city officials and/or city workers may in some circumstances indicate an expensive city administration.

9.6 Number of Registered Voters as a Percentage of the Voting Age Population (Supporting Indicator)

9.6.1 *General*

Determining the percentage of the number of registered voters from the voting age population can reveal the legitimacy and quality of the electoral process in a city. For citizens to exercise their democratic right to vote there must be a comprehensive and inclusive electoral register, also called a voters list; and this must be carefully maintained to ensure that each eligible citizen is registered to vote once and only once. A voters' list makes it possible to separate two of the most important functions of the election authority: verifying voter eligibility and controlling the legitimacy of the balloting process.

9.6.2 *Supporting Indicator Requirement*

The number of registered voters as a percentage of the voting age population shall be calculated as the total number of registered voters, as determined by the official voter register (numerator) divided by the voting age population (denominator). The result shall then be multiplied by 100 and expressed as a percentage.

Number of registered voters shall refer to the number of names on the voters' register at the time that the registration process closes (cut-off date), as reported by the election authority. The election authority should use one of three options for voter registration: a periodic list, a continuous register/list, or a civil registry. Any one of these options can determine the number of registered voters.

Voting age population shall include all citizens of legal voting age.

NOTE — Voting age population is not necessarily an exact measure of the number of citizens entitled to vote as it does not take into account legal or systemic barriers to the exercise of the franchise or account for non-eligible members of the population, such as resident non-citizens or in some jurisdictions persons serving a sentence of imprisonment in a penal or correctional institution [the voting eligible population (VEP) would capture these discrepancies but it is very hard to achieve the data required to measure VEP].

9.6.3 *Data Source*

See **9.1.3**.

10 HEALTH

10.1 Average Life Expectancy at Birth (Core Indicator)

10.1.1 *General*

Life expectancy at birth measures the average number of years a person is expected to live under prevailing mortality conditions. Life expectancy at birth is closely connected with health conditions, which are an integral part of development. Mortality is also one of the variables that determine the size of human populations and their potential for future growth. Life expectancy at birth is also a measure of overall quality of life in a country and summarizes mortality at all ages. It can also be thought of as indicating the potential return on investment in human capital and is necessary for the calculation of various actuarial measures.

10.1.2 *Core Indicator Requirements*

The average life expectancy at birth shall be calculated as the average number of years to be lived by a group of people born in the same year, if health and living conditions at the time of their birth remained the same throughout their lives.

10.1.3 *Data Source*

In India, life expectancy at various broad age groups has been estimated through Sample Registration System (SRS) conducted by the Census Commissioner of India. However, SRS data is available only for the states but not for the cities, owing to sampling methodology adopted. Cities will need to make assessment of life expectancy through expert agencies.

NOTE — The life tables generated under SRS are based on the mortality package for life table estimation (MORTPAK 4), which is a United Nation's software package for mortality measurements.

10.2 Under Age Five Mortality per 1 000 Live Births (Core Indicator)

10.2.1 *General*

The under age five mortality rate is a leading indicator of the level of child health and overall development in cities. Child mortality is an indicator of the status of the city as a healthy or unhealthy place to live. In addition, mortality rates are among the most frequently used indicators to compare levels of socio-economic development across countries. Improving child mortality rates is a vital component of the Sustainable Development Goals.

10.2.2 *Core Indicator Requirements*

The under age five mortality per 1 000 live births shall refer to the probability of a child born in a specified year dying before reaching the age of five, and shall be expressed as a rate per 1 000 live births.

NOTE — The under age five mortality rate, is strictly speaking, not a rate (that is the number of deaths divided by the number of population at risk during a certain period of time) but a probability of death derived from a life table and expressed as rate per 1 000 live births.

Age-specific mortality rates among children and infants shall be calculated from birth and death data derived from vital registration, census, and/or household surveys. Estimates based on household surveys data shall be obtained,

a) directly, using birth history, as in demographic and health surveys, or
b) indirectly, using the Brass method, as specified in the Multiple Indicator Cluster Surveys.

The data shall then be summed for children under age five and shall be expressed as a rate per 1 000.

The under age five mortality per 1 000 live births should be computed for boys, girls and the total population of children of this age group, to facilitate understanding of gender bias.

10.2.3 *Data Source*

The registration of *Births and Deaths Act,* 1969 requires the state governments to appoint Registrars for compulsory registration of all births and deaths in their respective local areas. Usually, an officer of the local body (municipality, panchayat, cantonment board, etc) is appointed as the Registrar. Data on births and deaths may be secured from the Registrar.

NOTE — It would be desirable to ascertain the list of all the authorized Registrars in the city and secure data from all of them.

10.3 Number of In-Patient Hospital Beds per 100 000 Population (Core Indicator)

10.3.1 *General*

The number of in-patient public hospital beds is one of the few available indicators, which monitor the level of a health service delivery. Service delivery is an important part of health systems, and in-patient public hospital bed density is one of the few indicators that can be collected.

10.3.2 *Core Indicator Requirements*

The number of in-patient hospital beds per 100 000 shall be calculated as the total number of in-patient public and private hospital beds (numerator), divided by 100 000th of the city's total population (denominator). The result shall be expressed as the number of in-patient public and private hospital beds per 100 000 of the city population.

Hospital beds shall include in-patient and maternity beds. This shall include beds in wards, which are closed for reasons, such as lack of health staff, and building works. It shall also include beds for patients admitted who require continual assistance, incubators and specialized care. It may not include day care beds, pre-anesthesia beds, wake-up beds, beds for members of a patient's family, and beds for hospital staff.

10.3.3 *Data Source*

This indicator should rely on administrative records, based on reported data by public inpatient facilities. Data may also come from censuses of health care facilities.

10.4 Number of Physicians per 100 000 Population (Core Indicator)

10.4.1 *General*

The availability of physicians is an important indicator of the strength of a city's health system. There is evidence that the number of physicians is positively associated with immunization coverage, outreach of primary care, and infant, child and maternal survival. In this standard, physicians may also be referred to as doctors.

10.4.2 *Core Indicator Requirements*

The number of physicians per 100 000 population shall be calculated as the number of general or specialized practitioners whose workplace is in the city (numerator) divided by one 100 000th of the city's total population (denominator). The result shall be expressed as the number of physicians per 100 000 population.

For this indicator, a physician shall be defined as someone who graduates from any facility or school of medicine whose workplace is in the city.

Full-time equivalence (FTE) shall be applied, in order to capture doctors working part-time in hospitals and in practices.

10.4.3 *Data Source*

Cities should report the number of physicians based on administrative records, such as physicians registered with the Medical Council of India in the City. Information may also be obtained from the census, labour force statistics or other surveys, which inquire about occupation.

The accuracy and completeness of the human resource data can be a problem because databases are not updated frequently, private sector data are often not included and definitions of workers vary. It is for this reason that yearly updated data sources, such as administrative records, should be used. The definition presented above shall be the definition used when gathering data to report on this indicator.

10.5 Number of Disabled Persons per 100 000 Population (Supporting Indicator)

10.5.1 *General*

Every city should aim to be an inclusive society in which equal opportunities and access are provided for the growth and development of the persons with disabilities (PwDs) to lead productive, safe and dignified lives.

Accordingly, the city should have the details about the number of PwDs and their social and economic status, which should enable the city administration to provide for social and physical infrastructure for them commensurate with requirements of barrier free environment.

10.5.2 *Supporting Indicator Requirements*

The number of disabled persons per 100 000 population shall be calculated as the number of disabled persons residing in the city (numerator) divided by 100 000th of the city's total population (denominator). The result shall be expressed as the number of disabled persons per 100 000 population.

Disability has been defined under the *Rights of Persons with Disabilities Act*, 2016 and covers impairments relating to blindness and low vision; deaf and hard of hearing; locomotor disability including cerebral palsy, leprosy cured, dwarfism, acid attack victims and muscular dystrophy; autism, intellectual disability, specific learning disability and mental illness; etc.

10.5.3 *Data Source*

Data on the PwDs is available in the decennial census. Cities can update the same through specific surveys.

10.6 Number of Nursing and Midwifery Personnel per 100 000 Population (Supporting Indicator)

10.6.1 *General*

The number of nursing and midwifery personnel is a good indication of the city's health system and the strength of its outreach for maternal health.

10.6.2 *Supporting Indicator Requirements*

The number of nursing and midwifery personnel shall be calculated as the total number of nurses and midwives (numerator), divided by one 100 000th of the city's total population (denominator). The result shall be expressed as the number of nursing and midwifery personnel per 100 000 population.

The number of nurses shall include actively practicing nurses and midwives employed in public and private hospitals, clinics and other health facilities, including self-employed nurses and midwives. Both fully-qualified nurses with post-secondary education in nursing and vocational/associate/auxiliary/practical nurses with a lower level of nursing skills but also usually registered, shall be reported.

NOTE — Some figures may be underestimated or overestimated when it is not possible to distinguish whether the data includes health workers in the private sector, double counts of health workers holding two or more jobs at different locations, health service providers working outside the health care sector (for example, nurses working in a school or large private company), workers who are unpaid or unregulated but performing health care tasks (for example, volunteer community health workers) or people with health vocational training who are not currently engaged in the national health labour market (for example, unemployed, migrated, retired or withdrawn from the labour force for personal reasons).

10.7 Suicide Rate per 100 000 Population (Supporting Indicator)

10.7.1 *General*

Suicide rate is a serious issue in many cities and reflects on mental health in a city, which is central to human development.

10.7.2 *Supporting Indicator Requirements*

The number of deaths by suicide per 100 000 population shall be calculated as the total number of reported deaths by suicide (numerator) divided by 100 000th of the city's total population (denominator). The result shall be expressed as the number of deaths by suicide per 100 000 population.

Death by suicide shall refer to acts deliberately initiated and performed by a person who fully acknowledges the fatal outcome of such acts.

10.7.3 *Data Source*

The National Crime Records Bureau compiles state-wise information on accidental deaths and suicides in India (ADSI) and publishes the same annually on its website. This data is generated by the police station houses and compiled at district and state levels. The ADSI also contains city-wise information in respect of 53 cities having population of over 10 lakh. For other cities, police station-wise data can be consolidated to generate city level information.

11 HOUSING

11.1 Percentage of City Population Living in Slums (Core Indicator)

11.1.1 *General*

The percentage of the population living in slums is an indicator of the number of city residents living in sub-standard or insecure housing. Evidence shows that slums are growing and becoming permanent features of urban landscapes. One out of every five city dwellers lives in a slum today. Since slums host significantly large proportions of the urban population it is important to measure them.

11.1.2 *Core Indicator Requirements*

The percentage of city population living in slums shall be calculated as the number of people living in slums (numerator) divided by the city's total population (denominator). The result shall then be multiplied by 100 and expressed as a percentage.

The number of people living in slums in each city is available in the Census 2011.

Different cultures and countries define the physical and social attributes of slums differently. United Nations Human Settlements Programme (UN-Habitat) acknowledges this diversity and the fact that slums take many different forms and names.

The legal definition of a 'Slum' is available in the *Slum Areas (Improvement and Clearance) Act*, 1956. Broadly speaking, a slum household refers to a group of individuals living under the same roof in an urban area who lack one or more of the following five conditions:

a) *Durable housing* — A house is considered 'durable' if it is built on a non-hazardous location and has a structure permanent and adequate enough to protect its inhabitants from the extremes of climatic conditions, such as rain, heat, cold and humidity.

b) *Sufficient living area* — A house is considered to provide a sufficient living area for the household members if not more than three people share the same room.

c) *Access to improved water* — A household is considered to have access to improved water supply if it has a sufficient amount of water for family use, at an affordable price, available to household members without being subject to extreme effort, especially on the part of women and children.

d) *Access to sanitation* — A household is considered to have adequate access to sanitation if an excreta disposal system, either in the form of a private toilet or a public toilet shared with a reasonable number of people, is available to household members.

e) *Secure tenure* — Secure tenure is the right of all individuals and groups to effective protection against forced evictions. People have secure tenure when there is evidence of documentation that can be used as proof of secure tenure status or when there is either *de facto* or perceived protection against forced evictions.

Care should be taken to avoid double counting so as to not exaggerate or over-count the percentage of population in slums.

11.1.3 *Data Source*

Data for the above conditions should be gathered from census and survey data and information from agencies working with slums. In Census 2011, for the first time data in percentage to total households up to village in rural and wards in urban area are available in public domain. While the absolute figures are only available in public domain up to sub-district/town level only, similar data for ward and enumeration block levels can be obtained from the district census office.

11.2 Number of Homeless per 100 000 Population (Supporting Indicator)

11.2.1 *General*

Having a home to live in can be considered a basic need. There may be several reasons for a homeless situation, such as the housing price to income ratio.

11.2.2 *Supporting Indicator Requirements*

The number of homeless per 100 000 population shall be calculated as the total number of homeless people (numerator), divided by one 100 000th of the city's total population (denominator). The result shall be expressed as the number of homeless per 100 000 population.

The United Nations defines homelessness as 'Absolute homelessness refers to those without any physical shelter, for example, those living outside, in parks, in doorways, in parked vehicles, or parking garages, as well as those in emergency shelters or in transition houses for women fleeing abuse'.

In India, Census 2011 defines houseless households as 'Households which do not live in buildings or census houses but live in the open or road side pavements, in hume pipes, under fly-overs and staircases, or in the open in places of worship, mandaps, railway platforms, etc'.

11.2.3 *Data Source*

Data for the above conditions should be gathered from census and survey data and information from agencies working with slums.

11.3 Percentage of Households that Exist Without Registered Legal Titles (Supporting Indicator)

11.3.1 *General*

Understanding the percentage of households that exist without registered legal titles informs municipal leaders on housing security for city residents as well as housing conditions, infrastructure requirements and builds a better database for less formal parts of the city.

11.3.2 *Supporting Indicator Requirements*

The percentage of households that exist without registered legal titles shall be calculated as the number of households that exist without registered legal titles (numerator) divided by the total number of households (denominator). The result shall then be multiplied by 100 and expressed as a percentage.

Unregistered legal title includes the following tenure types: unregistered lease or leaseholds, rental, occupancy right, use right (including sub-lease, sub-rental and co-tenancy, and co-occupancy right).

11.3.3 *Data Source*

Information on this indicator is expected to be available with the local municipality.

11.4 Percentage of Slum Dwellers Having the Right to Tenure (Supporting Indicator)

11.4.1 *General*

Right to tenure would encourage the slum dwellers participate more actively in improvement of their shelter and the surroundings.

11.4.2 *Supporting Indicator Requirements*

The percentage of slum dwellers having the right to tenure shall be calculated as the total number of slum dwellers having the right to tenure (numerator) divided by the total number of slum dwellers (denominator) within the city.

11.4.3 *Data Source*

Data on number of slum dwellers having the right to tenure would be available in the decennial census documents. This may be updated from the local bodies. In some cases, surveys can also be conducted.

12 RECREATION

12.1 Square Metres of Public Indoor Recreation Space per Capita (Supporting Indicator)

12.1.1 *General*

Recreation is an important aspect of city life, contributing to the health of citizens and the vitality of the city. Recreation is a service that many cities provide through local bodies or related office. It is recommended that this space is made accessible to the elderly, people with disabilities and wheelchair users in accordance with National Building Code of India 2016.

12.1.2 *Supporting Indicator Requirements*

Square metres of public indoor recreation space per capita shall be calculated as the square metres of indoor public recreation space (numerator) divided by the population of the city (denominator), and shall be expressed as the number of square meters of indoor recreation space per capita.

NOTE — The need for indoor public recreational spaces varies depending on local climatic and cultural conditions.

Public recreation space shall refer to land and buildings open to the public for relaxation, amusement or leisure pursuits. Recreation space shall include only space that primarily serves a recreation purpose.

Indoor public recreation space should include,

a) city-owned or maintained buildings; and
b) other recreation buildings within the city not owned or operated by the city, provided they are open to the public. This category may include state or provincially owned buildings, schools and colleges, as well as non-profit organizations. If cities report only city-owned recreation space, this shall be noted.

For multi-story buildings the floor area of all floors in the building should be counted, if known.

For multi-use facilities only the portion of the building devoted to recreation shall be counted (the play areas at a school or college, for example, not the entire school site).

The area of the entire recreation site shall be included (including, for example, building maintenance and utility areas) but shall exclude parking areas.

NOTE — Many cities report city-owned recreation space and this does not include the contribution to recreation from non-city-owned facilities. While the methodology in this standard appears complex, the result will ultimately be more meaningful. It is recommended that a recreation space inventory be created.

12.1.3 *Data Source*

This information should be obtained from the city planning department together with departments knowledgeable about the city.

Recreation spaces may also be delineated using aerial photography and/or land use maps. Once the areas have been identified on a map, the area in square metres may be calculated using low cost Geographic Information Systems (GIS) or, if not available, through use of hand-held measuring devices. Area may be calculated in hectares or acres and converted to square meters.

12.2 Square Metres of Public Outdoor Recreation Space per Capita (Supporting Indicator)

12.2.1 *General*

Recreation is an important aspect of city life, contributing to the health of citizens and the vitality of the city. Recreation is a service that many cities provide through local bodies related office. This will include outdoor recreation space. It is recommended that this space is made accessible to the elderly, people with disabilities and wheelchair users in accordance with National Building Code of India 2016.

12.2.2 *Supporting Indicator Requirements*

Square metres of public outdoor recreation space per capita shall be calculated as square metres of outdoor public recreation space (numerator) divided by the population of the city (denominator), and shall be expressed as the number of square meters of outdoor recreation space per capita.

Public recreation space shall refer to land and open space available to the public for relaxation, amusement or leisure pursuits. Recreation space shall include only space that primarily serves a recreation purpose.

Outdoor recreation space should include,

a) city-owned or maintained land; and
b) other-recreation lands within the city not owned or operated by the city, provided they are open to the public. This category may include state or provincially owned lands, school and college grounds, as well as non-profit organizations. If cities report only city-owned recreation space, this shall be noted.

For multi-use facilities, only the portion of the land devoted to recreation shall be counted (the play areas at a school or college, for example, not the entire school site). Double counting shall be avoided. For example, do not include indoor facilities on parkland.

The area of the entire outdoor recreation site shall be included (including, for example wooded areas of parks, building maintenance and utility areas) but shall exclude parking areas.

NOTE — Many cities report city-owned recreation space and this does not include the contribution to recreation from non-city owned facilities. While the methodology in this Standard is more complex, the result will ultimately be more meaningful. It is recommended that a recreation space inventory be created.

12.2.3 *Data Source*

This information should be obtained from a city planning department together with departments knowledgeable about the city.

Outdoor recreation spaces may also be delineated using aerial photography and/or land use maps. Once the areas have been identified on a map, the area in square metres may be calculated using low cost Geographic Information Systems (GIS) or, if not available, through use of hand-held measuring devices. Area may be calculated, in hectares or acres, and converted to square metres.

12.3 Number of Art Galleries, Museums, Cultural Centres per 100 000 Population (Supporting Indicator)

12.3.1 *General*

Cities require to maintain and showcase their cultural and social heritage by way of art galleries, museums, cultural centres and similar institutions.

12.3.2 *Supporting Indicator Requirements*

The number of art galleries, museums, cultural centres and similar institutions per lakh of population shall be calculated as the number of such institutions in government and other sectors, but available to public at large (numerator) divided by one 100 000th of the city’s total population (denominator). The result shall be expressed as the number of art galleries, museums and cultural centres per 100 000 population.

12.3.3 *Data Source*

This information should be obtained from a city planning department together with the licensing department. Relevant departments and organizations of the state government can also provide additional information.

13 SAFETY

13.1 Number of Police Personnel per 100 000 Population (Core Indicator)

13.1.1 *General*

The number of sworn police personnel per 100 000 population is an indicator of the overall crime prevention in place in a city.

13.1.2 *Core Indicator Requirements*

The number of police personnel per 100 000 population shall be calculated as the number of permanent full-time (or full-time equivalent) sworn police personnel (numerator) divided by one 100 000th of the city’s total population (denominator). The result shall be expressed as the number of police personnel per 100 000 population.

Sworn law enforcement police personnel should meet the following criteria: work in an official capacity; have full arrest powers; carry identification; and be paid from governmental funds set aside specifically for payment of sworn law enforcement representatives.

Each year, law enforcement agencies shall report the total number of sworn law enforcement officers as of a locally determined date. Personnel counts shall be based on permanent, full-time employees.

13.1.3 *Data Source*

Data for this indicator is available on the web portal of National Bureau of Police Research and Development (BPRD), for the states. City-wise data in respect of 51 cities having Police Commissioners as on 1 January 2015 is also available on the same portal. For the other cities, the State Police Department has this information available almost readily.

13.2 Number of Homicides per 100 000 Population (Core Indicator)

13.2.1 *General*

The number of homicides is an indicator of the amount of crime and an indicator of feelings of personal safety and can affect incentives to invest.

13.2.2 *Core Indicator Requirements*

The number of homicide per 100 000 population shall be calculated as the number of reported homicides (numerator) divided by 100 000th of the city's total population (denominator). The result shall be expressed as the number of homicides per 100 000 population.

Homicide shall include intentional and non-intentional homicide. Intentional homicide shall refer to death deliberately inflicted on a person by another person, including infanticide. Non-intentional homicide shall refer to death non-deliberately inflicted on a person by another person. This shall include manslaughter, but shall exclude traffic accidents that result in the death of a person, and suicides.

13.2.3 *Data Source*

Data on crime is compiled by State Crime Record Bureaus and consolidated in the form of a Compendium at national level by the National Crime Record Bureau (NCRB), annually. The latest compendium on 'Crime in India', which also includes city-level data for 53 metro-cities, that is cities with population of over 10 lakh. In respect of every city, police station level data can be obtained from the respective State Crime Record Bureau, which can be aggregated to obtain data for the whole or part of a city. These databases include details in respect different social segments, such as crime against women, scheduled castes/tribes, children, etc.

NOTE — Homicides are not always reported as such. In particular, domestic homicides are sometimes reported as suicides or accidents.

13.3 Crimes Against Women Per 100 000 Population (Core Indicator)

13.3.1 *General*

The number of crimes against women in a city is considered a benchmark for the overall level of safety in the city.

13.3.2 *Core Indicator Requirements*

The number of crimes against women shall be calculated as the total number of all such crimes reported (numerator) divided by one 100 000th of the city's total population (denominator). The result shall be expressed as the number of crimes against women per 100 000 population.

Crimes against women include crime head, namely rape; assault on women with intent to outrage her modesty; insult to the modesty of women; importation of girls from foreign country; cruelty by husband or his relatives; kidnapping and abduction of women; abetment of suicides of women; dowry deaths under the *Dowry Prohibition Act*, 1961; and crime under the *Indecent Representation of Women (Prohibition) Act*, 1986, the *Commission of Sati Prevention Act*, 1987, the *Protection of Women from Domestic Violence Act*, 2005 and the *Immoral Traffic (P) Act*, 1956.

13.3.3 *Data Source*

Data on crime is compiled by State Crime Record Bureaus and consolidated in the form of a Compendium at national level by the National Crime Record Bureau (NCRB), annually. The latest compendium on 'Crime in India', which also includes city-level data for 53 metro-cities, that is cities with population of over 10 lakh. In respect of every city, police station level data can be obtained from the respective State Crime Record Bureau, which can be aggregated to obtain data for the whole or part of a city. These databases include details in respect different social segments, such as crime against women, scheduled castes/tribes, children, etc.

13.4 Response Time for Police Department from Initial Call (Supporting Indicator)

13.4.1 *General*

The average response time (in minutes and seconds) it takes a police department to respond to an initial distress call is an indicator of how protected a city's residents are from security and safety threats. Because it has the appearance of objectivity, police response time is a valuable and key operational measure used to assess system performance from the citizen's perspective.

13.4.2 *Supporting Indicator Requirements*

The response time for police department from initial call shall be calculated as the sum of number of all initial distress calls to the on-site arrival of the police department personnel for the year in minutes and seconds (numerator) divided by the number of police department responses in the same year (denominator). The result shall be expressed as the response time for police department from initial call in minutes and seconds.

The total number of minutes and seconds taken to respond to all emergency calls shall include the time elapsed from receiving the initial call for assistance to arrival on-site of police department personnel is calculated for the preceding 12 months.

13.4.3 *Data Source*

The city police office maintains the information on calls received and responded.

13.5 Violent Crime Rate per 100 000 Population (Supporting Indicator)

13.5.1 *General*

The number of violent crimes is an indicator of the amount of serious criminal offences in a city and a lead indicator of feelings of personal safety. The number of violent crimes in a city is considered a benchmark measure of the overall level of safety in the city.

13.5.2 *Supporting Indicator Requirements*

The violent crime rate per 100 000 population shall be calculated as the total number of all violent crimes reported (numerator) divided by one 100 000th of the city's total population (denominator). The result shall be expressed as the number of violent crimes per 100 000 population.

Violent crimes shall include offences that involve force or the threat of force to a person. Total violent crimes reported shall be calculated as the total sum of the number of murders and non-negligent manslaughters, the number of rapes, the number of robberies and the number of aggravated assaults.

Furthermore, a violent crime should be classified as one of the following four offences (in order of severity): murder and non-negligent manslaughter; rape; robbery; and, aggravated assault.

For a multiple offence, only the most serious/severe offence shall be counted.

13.5.3 *Data Source*

See **13.3.3**.

13.6 Number of Professional Firefighters per 100 000 Population (Core Indicator)

13.6.1 *General*

Fire response is a fundamental service for protecting life and property of citizens. Cities with populations of 100 000 or more usually have professional fire brigades with full-time employees. These are often supported by volunteer firefighters. In smaller cities and rural municipalities, fire brigades often consist mainly of volunteer workers. However, in respect of this indicator, only full-time, professional firefighters are to be counted.

13.6.2 *Core Indicator Requirements*

The number of full time firefighters per 100 000 population shall be calculated as the total number of such persons (numerator) divided by one 100 000th of the city population (denominator). The result shall be expressed as the number of professional firefighters per 100 000 population.

13.6.3 *Data Source*

The district and city fire department offices invariably maintain the statistics on the number of full time firefighters available in the city.

13.7 Number of Volunteer and Part-time Firefighters per 100 000 Population (Supporting Indicator)

13.7.1 *General*

Fire response is a fundamental service for protecting life and property of citizens. Cities with populations of 100 000 or more usually have professional fire brigades with full-time employees. These are often supported by volunteer firefighters. In smaller cities and rural municipalities, fire brigades often consist mainly of volunteer workers.

13.7.2 *Supporting Indicator Requirements*

The number of volunteer and part time firefighters per 100 000 population shall be calculated as the total number of volunteer and part time firefighters (numerator) divided by one 100 000th of city's total population (denominator). The result shall be expressed as the number of volunteer and part time firefighters per 100 000 population.

Volunteer firefighters shall refer to individuals who respond to incidents without pay.

Part-time firefighters shall refer to individuals who are not considered full time career firefighters and are paid only for incidents that they respond to. The Home Guards and Civil Defence personnel, who are engaged as such on part-time basis, shall be considered as part of this indicator.

NOTE — The term 'volunteer' may be used in reference to a group of part-time or on call firefighters who may have other occupations when not engaged in occasional firefighting. Therefore, volunteer and part-time firefighters are considered to be the same classification.

13.7.3 *Data Source*

In general, the fire department of state/city should be maintaining the data on volunteer and part time firefighters. In most states, the civil defence and home guards department has got a district-level office, which maintains the information on the trained personnel available on their payrolls/registers.

NOTE — It would also be desirable for the municipalities to promote voluntary participation of citizens in firefighting and protection activities and maintain a record of such volunteers.

13.8 Number of Fire Related Deaths per 100 000 Population (Core Indicator)

13.8.1 *General*

One of the many measures used to demonstrate the effectiveness of a city's fire services is the number of fire related deaths that occur on an annual basis.

13.8.2 *Core Indicator Requirements*

The number of fire related deaths per 100 000 population shall be expressed as the number of deaths directly attributed to a fire incident with death occurring within 30 days. This indicator shall be calculated as the total number of citizen fire related deaths recorded in a 12 month period (numerator), divided by one 100 000th of the city's total population (denominator). The result shall be expressed as the number of fire related deaths per 100 000 population.

13.8.3 *Data Source*

The National Crime Records Bureau compiles state-wise information on accidental deaths and suicides in India (ADSI), including in respect of accidental fire and forest fires, and publishes the same annually on its website. This data is generated by the police station houses and compiled at district and state levels. The ADSI also contains city-wise information in respect of 53 cities having population of over 10 lakh. For other cities, police station wise data can be consolidated to generate city level information.

In addition, the local fire department office and the city Disaster Management Authority may also be a possible source for such information.

13.9 Number of Natural Disaster Related Deaths per 100 000 Population (Core Indicator)

13.9.1 *General*

The attractiveness of cities for citizens and investors alike, is affected by the frequency and magnitude of natural disasters occurring within a city and a city's ability to respond. The natural disaster related losses of lives in the past can be indicative of a city's potential future exposure.

13.9.2 *Core Indicator Requirements*

The number of natural disaster related deaths per 100 000 population shall be expressed as the number of deaths directly attributed to natural disaster incidents. This indicator shall be calculated as the total number of natural disaster related deaths recorded in a 12 month period (numerator), divided by one 100 000th of the city population (denominator). The result shall be expressed as the number of natural disaster related deaths per 100 000 population.**13.9.3** *Data Source*

13.9.3 *Data Source*

See 13.8.3.

13.10 Response Time for Emergency Response Services from Initial Call (Supporting Indicator)

13.10.1 *General*

The average response time (in minutes and seconds) it takes an emergency and rescue department to respond to an initial distress call is an indicator of how protected a city's residents are from security and safety threats.

13.10.2 *Supporting Indicator Requirements*

The response time for the emergency and rescue department from the initial call shall be calculated as the sum of time elapsed from receiving all initial distress calls to the on-site arrival of the emergency personnel and equipment in minutes and seconds for the year (numerator) divided by the number of emergency responses in the same year (denominator). The result shall be expressed as the response time for emergency response services from initial call, in minutes and seconds.

The total number of minutes and seconds taken to respond to all emergency rescue calls shall include the time elapsed from receiving the initial call for assistance to arrival on-site of emergency personnel and equipment is calculated for the preceding 12 months.

This indicator includes all forms of emergency response, for example rescue services and ambulatory rescue personnel, and police personnel responding to criminal acts such as robberies and assault.

NOTE — As an accurately recorded response time is objective, this indicator is a valuable key operational measure to assess system performance from the citizen's perspective.

13.10.3 *Data Source*

The emergency and rescue department, which normally maintains toll-free call numbers such as 100, 101,102 and 112 shall be the source for providing this information.

NOTE — Some states have moved to have a common '108' number for all such services including for medical emergencies.

13.11 Response Time for Fire Department from Initial Call (Supporting Indicator)

13.11.1 *General*

The average response time (in minutes and seconds) it takes a fire department to respond to an initial distress call is an indicator of how protected a city's residents are from fires and emergencies.

13.11.2 *Supporting Indicator Requirements*

The response time for a fire department from the initial call shall be calculated as the sum of time elapsed from receiving all initial distress calls to the on-site arrival of the fire department personnel and equipment in minutes and seconds for the year (numerator) divided by the number of fire department responses in the same year (denominator). The result shall be expressed as the response time for fire department from initial call in minutes and seconds.

The total number of minutes and seconds taken to respond to all emergency calls shall include the time elapsed from receiving the initial call for assistance to the on-site arrival of fire department personnel and equipment and is calculated for the preceding 12 months.

13.11.3 *Data Source*

In most cities, the fire department would be maintaining the details of distress calls received and the response time. In addition, the emergency and rescue department, which normally maintains toll-free call numbers, such as 100, 101, 102 and 112 shall be the source for providing this information.

13.12 Number of Buildings with Fire Safety Clearance per 10 000 Buildings (Supporting Indicator)

13.12.1 *General*

As the habitats are getting denser, the issue of fire safety in high rise buildings gets increasingly significant.

13.12.2 *Supporting Indicator Requirements*

The number of buildings of 15 m or more height or 500 m^2 or more of built space having fire safety clearance as a ratio of all buildings would fall in this category.

Fire safety norms would be as defined in the National Building Code of India 2016, duly reflected in the fire regulations/building bye laws and development control regulations of the local body concerned.

13.12.3 *Data Source*

States/local bodies that have adopted the online building plan approval system, will have such data available online and real time basis. In other cases, this information will be available with the city fire service department.

14 SEWERAGE AND SANITATION

14.1 Percentage of City Population Having Access to Sanitary Toilet Facilities (Core Indicator)

14.1.1 *General*

The percentage of the city population having access to sanitary toilet facilities is an indicator of city health, cleanliness and quality of life.

14.1.2 *Core Indicator Requirements*

Percentage of city population having access to sanitary toilet facility shall be calculated as the number of people within the city that are provided with water flush sanitary toilets with on site disposal (twin pit pour flush sanitary toilet), septic tank with sanitary disposal of its effluents and individual as well as community toilets connected with wastewater collection network (numerator) divided by city population (denominator). The result shall then be multiplied by 100 and expressed as a percentage.

The number of households having access to sanitary toilet facility be first collected and the number is then multiplied by the current average number of people in household size of the city to determine the number of persons having access to sanitary toilet facility.

In case of people provided with community toilet facility the number of people will be worked out on the basis of 10 persons per latrine seats provided at the community facility. Community toilet facilities provided at commercial places, bus stands, etc, shall not be counted.

14.1.3 *Data Source*

Information on the number of households having access to sanitary toilet facility in the city should be obtained from the local body and authorized local operator(s) of wastewater systems.

14.2 Percentage of City Population Served by Sewage (Wastewater) Collection (Core Indicator)

14.2.1 *General*

The percentage of the city population served by a wastewater collection is an indicator of city health, cleanliness and quality of life. Wastewater collection and treatment is a significant component of the Sustainable Development Goals, Goal 6: Ensure Availability and Sustainable Management of Water and Sanitation for All.

14.2.2 *Core Indicator Requirements*

Percentage of city population served by wastewater collection shall be calculated as the number of people within the city that are served by wastewater collection (numerator) divided by the city population (denominator). The result shall then be multiplied by 100 and expressed as a percentage.

The number of households in the city serviced with regular wastewater collection shall first be determined by counting the number of households that are connected as part of a public or community owned system of discharge of wastewater through a pipe or similar duct that is connected to a network that takes it to a facility where it is treated. The number of households being serviced by wastewater connection shall then be multiplied by the then current average household size for that city to determine the number of persons serviced with wastewater collection.

NOTE — Results will only indicate whether or not a house has access to wastewater systems, not the quality of the system, the capacity and quality of the service, the levels of loss (contamination), or the capacity of the treatment plants to meet the growth in wastewater volumes. Some of these limitations will be addressed in other supporting indicators.

14.2.3 *Data Source*

Information on the number of households in the city serviced with regular wastewater collection should be obtained from the local body and the authorized operator(s) of wastewater systems.

14.3 Percentage of the City's Wastewater that has Received no Treatment (Core Indicator)

14.3.1 *General*

It has been proven that improvement of water treatment reduces the incidence of a variety of water-borne diseases. A reliable wastewater treatment system is a major indicator of the level of local development and of community health. Water pollution from human waste is less of a problem in cities that can afford to treat sewage and wastewater, and water pollution can be minimized with adequate investment in treatment systems. The percentage of wastewater treated is a key indicator of water quality management.

14.3.2 *Core Indicator Requirements*

Percentage of the city's wastewater that has received no treatment shall be calculated as the total amount of the city's wastewater that has undergone no treatment (numerator) divided by the total amount of wastewater collected in the city (denominator). This result shall then be multiplied by 100 and expressed as a percentage.

No treatment shall refer to collected wastewater that is disposed without any treatment, including periods when wastewater volume exceeds treatment plant capacity.

14.3.3 *Data Source*

This information may be obtained by municipal authorities and the wastewater collection and treatment companies, such as the sewage boards or corporations.

14.4 Percentage of the City's Wastewater Receiving Primary Treatment (Core Indicator)

14.4.1 *General*

The percentage of wastewater treated is a key indicator of water quality management. It has been proven that improvement of water treatment reduces the incidence of a variety of water-borne diseases. A reliable wastewater treatment system is a major indicator of the level of local development and of community health. Water pollution from human waste is less of a problem in cities that can afford to treat sewage and wastewater, and water pollution can be minimized with adequate investment in treatment systems.

14.4.2 *Core Indicator Requirements*

The percentage of the city's wastewater receiving primary treatment shall be calculated as the total amount of the city's wastewater that has undergone primary treatment (numerator) divided by the total amount of wastewater collected in the city (denominator). This result is then multiplied by 100 and expressed as a percentage of the city's wastewater receiving primary treatment.

Primary wastewater treatment shall refer to the physical separation of suspended solids from the wastewater flow using primary clarifiers. This separation reduces total suspended solids as well as the biological oxygen demand (BOD) levels and prepares the waste stream for the next step in the wastewater treatment process.

NOTE — Biological Oxygen Demand (BOD) is the amount of dissolved oxygen required to oxidize or neutralize biodegradable matter in water. High BOD levels represent high amounts of contaminant matter, and the reduction of BOD is a common measure for determining the efficacy of water treatment.

Some cities have no system for treating wastewater. This shall be reported.

14.4.3 *Data Source*

This information may be obtained from municipal authorities and authorized water supply and treatment companies.

14.5 Percentage of the City's Wastewater Receiving Secondary Treatment (Supporting Indicator)

14.5.1 *General*

It has been proven that improvement of water treatment reduces the incidence of a variety of water-borne diseases. A reliable wastewater treatment system is a major indicator of the level of local development and of community health. Water pollution from human waste is less of a problem in cities that can afford to treat sewage and wastewater, and water pollution can be minimized with adequate investment in treatment systems. The percentage of wastewater treated is a key indicator of water quality management.

14.5.2 *Core Indicator Requirements*

Percentage of the city's wastewater receiving secondary treatment shall be calculated as the total amount of the city's wastewater that has undergone secondary treatment (numerator) divided by the total amount of wastewater collected in the city (denominator). The result shall then be multiplied by 100 and expressed as a percentage.

Secondary treatment shall refer to the process of removing or reducing contaminants or growths that are left in the wastewater from the primary treatment process. Secondary treatment reduces Biological Oxygen Demand (BOD) by microbial oxidation.

Some cities have no system for treating wastewater. This shall be reported.

14.5.3 *Data Source*

This information may be obtained from municipal authorities and the main water supply and treatment companies.

14.6 Percentage of the City's Wastewater that is being Recycled and Reused (Supporting Indicator)

14.6.1 *General*

Of the total fresh water supplied to a city, almost 80 percent get converted in to wastewater after use and can be reclaimed after suitable recycling. In the process of recycling, sludge also gets generated.

Reclaimed water can significantly augment freshwater sources and mitigate water stress for cities. Reclaimed water can be an ideal choice for industrial use, construction activities and horticulture including for avenue plantations.

Sludge can be used in agriculture and for generation of energy. However, sludge from certain sources could contain toxins, which need to be isolated. Decentralized wastewater treatment could help in identification and isolation of such sources.

14.6.2 *Core Indicator Requirements*

Percentage of the city's wastewater being recycled and reused shall be calculated as the total amount of the city's recycled wastewater that is being pushed into supply lines or being supplied to bulk users through tankers (numerator), divided by the total amount of wastewater that is received by the treatment plants of the city (denominator). The result shall then be multiplied by 100 and expressed as a percentage.

14.6.3 *Data Source*

This information may be obtained from municipal authorities and authorized wastewater supply and treatment companies/agencies.

15 SOLID WASTE

15.1 Percentage of City Population Covered with Regular Solid Waste Collection (Residential) (Core Indicator)

15.1.1 *General*

The percentage of the city population served by regular solid waste collection is an indicator of city health, cleanliness and quality of life. Solid waste systems contribute in many ways to public health, the local economy, the environment, and the social understanding and education about the environment.

15.1.2 *Core Indicator Requirements*

The percentage of city population with regular solid waste collection shall be calculated as the number of people within the city that are served by solid waste collection (numerator) divided by the total city population (denominator). The result shall then be multiplied by 100 and expressed as a percentage.

The number of households in the city serviced with regular solid waste collection shall first be determined. The number of households being serviced by the regular solid waste collection service shall then be multiplied by the current average household size for that city to determine the number of persons serviced with regular solid waste collection. Regular solid waste collection shall be defined as having the solid waste picked up from the household, transported and dumped at a proper treatment facility (recycling or landfill sites) on at least a weekly basis or every two weeks. If the solid waste is collected in any moving vehicle by persons who have not constituted a legally established entity, the house shall not be considered as a household serviced with a solid waste collection service.

NOTE — Use of persons rather than city area as the metric for this indicator avoids the distortion arising from local government areas that include both urban and non-urban areas.

15.1.3 *Data Source*

Information should be obtained from the local operator(s) of solid waste collection systems, census data, and municipal waste facilities as submitted in the annual form-II of *Solid Waste Management Rules*, 2016. The *Solid Waste Management Rules*, 2016 may be read along with similar rules, such as the *Bio-Medical Waste Management Rules*, 2016, *Construction and Demolition Waste Management Rules,* 2016, *E-Waste Management Rules*, 2016, *Hazardous and Other Waste (Management and Trans-Boundary Movement) Rules,* 2016, *Batteries (Management and Handling) Rules*, 2001 and *Plastic Waste Management Rules*, 2016.

15.2 Total Collected Municipal Solid Waste per Capita per Year (Core Indicator)

15.2.1 *General*

This indicator provides a measure of how much waste a city is producing and the level of service a city is providing for its collection. Higher levels of municipal waste contribute to greater environmental problems and therefore levels of collection, and also methods of disposal, of municipal solid waste are an important component of municipal environmental management. Collection of municipal solid waste is also an indicator of city management with regard to cleanliness, health and quality of life. Solid waste systems contribute in many ways to public health, the local economy, the environment, and the social understanding and education about the environment.

15.2.2 *Core Indicator Requirements*

This indicator shall be calculated as the total amount of solid waste (household and commercial) generated in tonnes (numerator) divided by the total city population (denominator). The total collected municipal solid waste per capita shall be expressed as the total municipal solid waste produced in the municipality per person per year.

Municipal waste shall refer to waste collected by or on behalf of municipalities.

The data shall only refer to the waste flows managed under the responsibility of the local administration including waste collected on behalf of the local authority by private companies or regional associations founded for that purpose.

Municipal waste should include waste originating from,

a) households; and
b) commerce and trade, small businesses, office buildings and institutions (for example, schools, hospitals and government buildings).

The definition should also include,

1) bulky waste (for example, white goods, old furniture and mattresses);
2) garden waste, leaves, grass clippings, street sweepings, the content of litter containers, and market cleansing waste, if managed as waste; and
3) waste from selected municipal services, that is waste from park and garden maintenance, waste from street cleaning services (for example, street sweepings, the content of litter containers, market cleansing waste), if managed as waste.

   The definition shall exclude:

   i) waste from municipal sewage network and treatment; and
   ii) municipal construction and demolition waste.

15.2.3 *Data Source*

Information should be obtained from the local operator(s) of solid waste collection systems, census data, and municipal waste facilities as submitted in the annual form-II of the *Solid Waste Management Rules,* 2016.

15.2.4 *Data Interpretation*

The proper discharge, transportation and treatment of solid waste is one of the most important components of life in a city and one of the first areas in which governments and institutions should focus. Solid waste systems contribute in many ways to public health, the local economy, the environment, and the social understanding and education about the environment. A proper solid waste system can foster recycling practices that maximize the life cycle of landfills and create recycling micro-economies, and it provides alternative sources of energy that help reduce the consumption of electricity and/or petroleum based fuels.

15.3 Percentage of the City's Solid Waste that is Recycled (Core Indicator)

15.3.1 *General*

Recycling the waste, after suitable segregation, not only helps in controlling the waste generation quantity but also manages the effective utilization of waste. In addition, it puts the waste to productive economic use.

Recycled materials shall include household waste, garden waste, construction and demolition waste, e-waste, hospital waste, industrial waste, etc. It shall also include those materials diverted from the waste stream, recovered, and processed into new products.

15.3.2 *Core Indicator Requirements*

The percentage of the city's solid waste that is recycled shall be calculated as the total amount of the city's solid waste that is recycled in tonnes (numerator) divided by the total amount of solid waste produced in the city in tonnes (denominator). The result shall then be multiplied by 100 and expressed as a percentage.

Recycled materials shall denote those materials diverted from the waste stream, recovered, and processed into new products.

Hazardous waste that is produced in the city and is recycled shall be reported separately.

15.3.3 *Data Source*

Information should be obtained from the local operator(s) of solid waste collection systems, census data, and municipal waste facilities as submitted in the annual form-II of the *Solid Waste Management Rules*, 2016.

15.4 Percentage of the City's Solid Waste that is Disposed of in a Sanitary Landfill (Supporting Indicator)

15.4.1 *General*

Many cities generate more solid waste than they can dispose of. Even when municipal budgets are adequate for collection, the safe disposal of collected waste often remains a problem. Open dumping and unsanitary landfills are sometimes the main disposal methods, particularly in lower income cities. Sanitary landfills are the norm in only a limited number of cities worldwide.

Open dumping and landfills are sometimes the main disposal methods chosen resulting in so many nuisances. Biodegradable waste and other useful wastes taken to landfill not only unnecessarily occupy the precious land in city but can also contribute to ground water contamination, methane production, odour nuisance, etc, if left unchecked. Hence, it is desirable that only limited and non-decomposable waste goes to landfills. However, all efforts should be made to make economic use of all waste by recycling, leading to a 'zero land-fill' situation.

15.4.2 *Supporting Indicator Requirements*

The percentage of the city's solid waste, that is disposed of in a sanitary landfill shall be calculated as the amount of the city's solid waste that is disposed of in a sanitary landfill in tonnes (numerator) divided by the total amount of solid waste produced in the city in tonnes (denominator). The result shall then be multiplied by 100 and expressed as a percentage.

Sanitary landfill shall refer to a carefully designed structure, which uses a clay liner or a synthetic liner in order to isolate solid waste from the surrounding environment. This isolation is accomplished with a bottom liner and daily covering of soil.

15.4.3 *Data Source*

See **15.1.3**.

15.5 Percentage of the City's Solid Waste that is Disposed of in an Incinerator (Supporting Indicator)

15.5.1 *General*

Many cities generate more solid waste than they can dispose of. Even when municipal budgets are adequate for collection, the safe disposal of collected waste often remains a problem. As sanitary landfill sites are limited, cities examine other alternatives for disposal, such as incineration.

Incinerators provide the quick way of processing the waste giving energy as a byproduct. The volume reduction is assumed to be the 90 percent of the original volume and the energy output can be refined by improving the quality of the processing waste in the initial phases.

15.5.2 *Supporting Indicator Requirements*

The percentage of the city's solid waste that is disposed of in an incinerator shall be calculated as the total amount of the city's solid waste that is disposed of in an incinerator in tonnes (numerator) divided by the total amount of solid waste produced in the city in tonnes (denominator). The result shall then be multiplied by 100 and expressed as a percentage.

15.5.3 *Data Source*

This information should be obtained from municipal bodies, public services and major private contractors dealing with solid waste processing and disposal. Data may be obtained from specific studies carried out on solid waste for specific projects and the state pollution control bodies/committee.

15.6 Percentage of the City's Solid Waste that is Burned Openly (Supporting Indicator)

15.6.1 *General*

Many cities generate more solid waste than they can dispose of. Even when municipal budgets are adequate for collection, the safe disposal of collected waste often remains a problem. Open burning as a disposal method remains an alternative for some cities facing budgetary limitations, particularly in lower income cities.

15.6.2 *Supporting Indicator Requirements*

The percentage of the city's solid waste that is burned openly shall be calculated as the amount of the city's solid waste that is burned in tonnes (numerator) divided by the total amount of solid waste produced in the city in tonnes (denominator). The result shall then be multiplied by 100 and expressed as a percentage.

Burned openly shall refer to the combustion of solid waste in an open dump or open space.

15.6.3 *Data Source*

This information should be obtained from municipal bodies, public services and major private contractors dealing with solid waste collection and disposal. Data may be obtained from specific studies carried out on solid waste for specific projects.

Information on selected disposal methods should be gathered from municipal facilities and operators, parastatal and private companies dealing with solid waste treatment. Solid waste experts, as well as NGOs working in this area, may be consulted.

When data are not available, an estimate of the proportion of waste to sanitary landfill and the proportion disposed to open dump should be provided.

15.7 Percentage of the City's Solid Waste that is Disposed of in an Open Dump (Supporting Indicator)

15.7.1 *General*

Many cities generate more solid waste than they can dispose of. Even when municipal budgets are adequate for collection, the safe disposal of collected waste often remains a problem. Open dump as a disposal method remains an alternative for some cities facing budgetary limitations, particularly in lower income cities.

15.7.2 *Supporting Indicator Requirements*

The percentage of the city's solid waste that is disposed of in an open dump shall be calculated as the amount of the city's solid waste that is disposed of in an open dump in tonnes (numerator) divided by the total amount of solid waste produced in the city in tonnes (denominator). The result shall then be multiplied by 100 and expressed as a percentage.

Open dump shall refer to an uncovered space or hole where solid waste is disposed of without further treatment.

15.7.3 *Data Source*

See **15.6.3**.

15.8 Percentage of the City's Solid Waste that is Disposed of by Other Means (Supporting Indicator)

15.8.1 *General*

Many cities generate more solid waste than they can dispose of. Even when municipal budgets are adequate for collection, the safe disposal of collected waste often remains a problem.

Other means shall refer to methods of disposal by means other than the ones indicated in **15.3** (recycling), **15.4** (sanitary landfill), **15.5** (incinerator), **15.6** (burned openly), and **15.7** (open dump).

15.8.2 *Supporting Indicator Requirements*

The percentage of the city's solid waste that is disposed of by other means shall be calculated as the total amount of the city's solid waste that is disposed of by other means in tonnes (numerator) divided by the total amount of solid waste produced in the city in tonnes (denominator). The result shall then be multiplied by 100 and expressed as a percentage.

15.8.3 *Data Source*

See **15.6.3**.

16 TELECOMMUNICATION AND INNOVATION

16.1 Number of Internet Connections per 100 000 Population (Core Indicator)

16.1.1 *General*

The number of internet connections is an indicator of information access and communication technology connectivity. Internet connections are available through wireless media as well as through fixed/wired media.

16.1.2 *Core Indicator Requirements*

The number of internet connections per 100 000 population shall be calculated as the number of internet connections in the city (numerator) divided by one 100 000th of the city's total population (denominator). The result shall be expressed as the number of internet connections per 100 000 population.

Internet connections shall refer to the number of internet subscriptions and not the number of people with internet access.

16.1.3 *Data Source*

Internet service and telecommunications providers in the form of subscriber locations and accounts keep Internet access records.

Census 2011 too gives information on households having computers with internet access.

Department of Telecommunications (DOT) compiles data on the availability of personal computers, number of internet users, telephone lines, mobile phones and televisions sets in the country and publishes it on their website for the country as a whole. DOT also publishes data on total number of telephone connections, in the categories of wireline, wireless, public, private, urban and rural and updates the same on a monthly basis on its web portal. DOT can possibly make arrangements to publish city level data as well.

16.2 Percentage of Households with Computer (Core Indicator)

16.2.1 *General*

Computer refers to a desktop computer, laptop (portable) computer, tablet or similar handheld computer. It does not include equipment with some embedded computing abilities, such as smart TV sets, or devices with telephony as a main function, such as mobile phones or smartphones.

Household with a computer means that the computer is available for use by all members of the household at any time. The computer may or may not be owned by the household, but should be considered a household asset.

Computers today are essential tools for empowering the citizens with knowledge and education. Computers contribute in enhancing the literacy level of any city. Further, for empowering the citizens with the various citizen services enabled by the internet, computer is a powerful enabler for ubiquitous internet experience.

Availability of computers will ensure all services associated with city like information sharing, e-healthcare, banking transactions, and public governance facilities are available to inhabitants as per their necessity and without any inconvenience.

16.2.2 *Core Indicator Requirements*

The percentage of households with computer shall be calculated as number of households using computers divided by total number of households in the city. The result shall be expressed as the percentage by multiplying by 100.

16.2.3 *Data Source*

Data on this indicator is available in the decennial census of population and amenities (for example, Table HH-12 of House-listing operations in Census 2011).

16.3 Percentage of Households with Internet Access (Supporting Indicator)

16.3.1 *General*

The Internet is a worldwide public computer network. It provides access to a number of communication services, including the world wide web, and carries e-mail, news, entertainment and data files, irrespective of the device used (not assumed to be only a computer. It may also be a mobile telephone, tablet, PDA, games machine, digital TV, and so on). Access can be *via* a fixed or mobile network. Household with internet access means that the internet is available for use by all members of the household at any time.

Availability of Internet across multiple platforms will ensure all services associated with city like information sharing, e-healthcare, banking transactions, and public governance facilities are available to inhabitants as per their necessity and without any inconvenience.

16.3.2 *Supporting Indicator Requirements*

Data for the same may be calculated as number of households using Internet (numerator) divided by total number of households in the city (denominator).

The result shall be expressed as the percentage by multiplying by 100.

16.3.3 *Data Source*

Data on this indicator is available in Census 2011 (Table HH-12 of House-listing operations).

16.4 Cyber Security Readiness for ICT Infrastructure and Online Citizen Service Delivery (Core Indicator)

16.4.1 *General*

Cyber security focuses on protecting computers, networks, programmes and data from unintended or unauthorized access, change or destruction.

Creation of large centralized databases that contains confidential information pertaining to users, accessible over the Internet in real time poses a threat to operational and security concerns like interception and tampering of data sent over the networks. To overcome this information technology (IT) infrastructure will have to be highly secure and resilient with proper backup systems to ensure round the clock availability.

Security and privacy issues will have to be countered at various stages of information lifecycle that is data collection, storage and transmission, by ensuring that standard operating procedures are followed during data collection, adequate IT infrastructure is available to handle large amount of data and proper security measures are adopted to protect the data.

Also, the authority, responsibility and accountability of the city administration will have to be well defined in case of any event of unauthorized access or leakage. To ensure the continued security of the information and communication technology (ICT) infrastructure, security audits shall need to be conducted at regular intervals and security definitions and patches updated.

16.4.2 *Core Indicator Requirement*

Cyber security readiness of the ICT infrastructure in a city shall be calculated as number of ICT enabled services that are secure and resilient (numerator) divided by total number of ICT enabled services in the city (denominator). The result shall be multiplied by 100 and expressed as a percentage.

16.4.3 *Data Source*

Data on cyber crime is compiled by State Crime Record Bureaus and consolidated in the form of a compendium at national level by the National Crime Record Bureau (NCRB), annually. The latest compendium on ‘Crime in India’, which also includes city-level data for 53 metro-cities, that is cities with population of over 10 lakh. Police station level data can be obtained from the respective State Crime Record Bureau, which can be aggregated to obtain data for the whole or part of a city. Data regarding the same may also possibly be captured from various citizen centric service providers, Internet Service Providers (ISPs), National Informatics Centre (NIC) and, more significantly, by the National Critical Information Infrastructure Protection Centre (NCIIP), which is the watchdog agency for ensuring the security of the ICT Infrastructure in the country.

16.5 Number of New Patents per 100 000 Population per Year (Supporting Indicator)

16.5.1 *General*

The number of patents issued to resident persons or corporations of a city is an indicator of commercial and technological innovation.

16.5.2 *Supporting Indicator Requirements*

The number of new patents per 100 000 population per year shall be calculated as the total number of new patents issued to resident persons and corporations of the city (numerator) divided by one 100 000th of the city’s total population (denominator). The result shall be expressed as the number of patents registered per 100 000 population.

16.5.3 *Data Source*

As patents are generally issued by the national government, cities will be reliant on another level of government to provide this information on an annual city-by-city basis. For instance:

a) Controller General of Patents, Designs and Trademarks, Ministry of Commerce and Industry for national level data.
b) Geographical Indication registry portal of the Controller General of Patents Designs and Trademarks, Ministry of Commerce and Industry for state level data.
c) The District Industries Office for city level data on patents.

17 TRANSPORTATION

17.1 Kilometres of High Capacity Public Transport System per 100 000 Population (Core Indicator)

17.1.1 *General*

The extent of a city’s transportation network can provide insight into traffic congestion, transportation system flexibility and urban form. Cities with larger amounts of public transport may tend to be more geographically compact and supportive of non-motorized modes of transportation.

17.1.2 *Core Indicator Requirements*

The kilometres of high capacity public transport system per 100 000 population shall be calculated by adding the kilometres of high capacity public transport systems operating within the city (numerator) divided by one 100 000th of the city's total population (denominator). The result shall be expressed as the kilometres of high capacity public transport system per 100 000 population.

High capacity public transport may include heavy rail metro, sub-way systems and commuter rail systems.

17.1.3 *Data Source*

Information on kilometres of high capacity public transport should be gathered from city/ district/ regional transport offices and the transit authorities/companies like the metro rail corporations and can also be counted using computerized mapping, aerial photography, or existing paper maps, all of which shall be field-verified. This information may be gathered from transport system plans or other master plans.

17.2 Kilometres of Light Passenger Public Transport System per 100 000 Population (Core Indicator)

17.2.1 *General*

The extent of a city's transportation network can provide insight into traffic congestion, transportation system flexibility, and urban form. Cities with larger amounts of public transport may tend to be more geographically compact and supportive of non-motorized modes of transportation. Light passenger public transport systems, such as the Bus Rapid Transit System (BRTS), tramways, pod systems, ferries, etc, are often more cost-effective than the heavy ones, particularly in the cities below 2 million population.

17.2.2 *Core Indicator Requirements*

The kilometres of light passenger public transport system per 100 000 population shall be calculated by adding the kilometres of light passenger transport systems provided within the city (numerator), divided by one 100 000th of the city's total population (denominator). The result shall be expressed as the kilometres of light passenger transport system per 100 000 population.

Light passenger transport may include light rail streetcars and tramways, bus systems including the Bus Rapid Transit System (BRTS), trolleybus, and other light passenger transport services.

17.2.3 *Data Source*

Information on kilometres of light passenger transport should be gathered from city/district/regional transport offices and the transit authorities/companies like the BRTS operator, tramways company, etc, and can also be counted using computerized mapping, aerial photography, or existing paper maps, all of which shall be field-verified. This information may be gathered from transport system plans or other master plans.

17.3 Annual Number of Public Transport Trips per Capita (Core Indicator)

17.3.1 *General*

Transport usage is a key indicator of how easy it is to travel in the city by modes other than single occupancy vehicles. The indicator might also provide insight into transportation policy, traffic congestion, and urban form. Cities with higher transport ridership rates tend to invest more in their transport systems and are more geographically compact. Transport usage also addresses overall travel patterns in the city, and not just the journey to work.

17.3.2 *Core Indicator Requirements*

Annual number of public transport trips per capita shall be calculated as the total annual number of transport trips originating in the city (ridership of public transport) (numerator), divided by the total city population (denominator). The result shall be expressed as the annual number of public transport trips per capita.

Transport trips shall include trips *via* heavy rail metro or sub-way, commuter rail, light rail streetcars and tramways, organized bus, trolleybus, and other public transport services.

Cities shall only calculate the number of transport trips with origins in the city itself.

NOTE — Transport systems often serve entire metropolitan areas, and not just central cities. The use of number of transport trips with origins in the city itself will still capture many trips whose destination are outside the city, but will generally capture the impact that the city has on the regional transport network.

17.3.3 *Data source*

Transport data should be gathered from a number of sources, including: the local/regional transport authorities, transport systems operators, and the revenue collection systems (for example number of fares purchased).

NOTES

1 Fare box records (for example, transport fares paid) are usually the primary source of data for this indicator. However, the relationship between fares purchased and trips taken is not always exact. For example, many transport systems do not actively check for proof of fare purchase often, riders are expected to have valid tickets, and are severely fined if a ticket is not presented, but enforcement of such rules is not uniform for every rider on every trip. Other transport systems offer monthly or weekly passes, which do not necessarily allow for accurate counts of each trip.

2 In many cities, a large number of trips are made *via* 'informal transport' services (for example, mini-buses not operated by the government or municipal transport corporation). These informal trips are not part of the official transport network and shall not be counted.

3 While higher transport ridership rates are generally considered desirable, extremely high ridership rates can also indicate cities with overcrowding problems.

17.4 Percentage Share of Electric Vehicles as Part of Total Vehicles in a City (Supporting Indicator)

17.4.1 *General*

In India, the automobile industry is one of the key sectors driving economic growth. More than 25 million vehicles including passenger vehicles, commercial vehicles, three wheelers and two wheelers were produced in 2016-17, reporting a jump of 5.41 percent from the previous fiscal year. However, it is also one of the biggest contributors of pollution. Therefore, shifting to electric mobility is one of the important aspects of de-carbonizing transport sector in the country.

17.4.2 *Supporting Indicator Requirements*

The percentage share of electric vehicles will be calculated as total electric vehicle registered in a year (numerator) per total vehicles registered in that year (denominator) for a city. The result shall be expressed as the percentage by multiplying by 100

17.4.3 *Data Source*

The data can be obtained from transport department of the city and Regional Transport Office (RTO).

17.5 Percentage of Road Network with Usable Pedestrian Pathway/Footpath Network (Supporting Indicator)

17.5.1 *General*

Sustainable cities should have equitable streets with priority to pedestrian infrastructure. The city should have street network to ensure safe and efficient access for all users including pedestrians. A transportation system that is conducive to pedestrian movement can reap many benefits in terms of reduced road fatalities and improved quality of life. Economic rewards both to the individual and to society are also realized through reduced health care costs and reduced dependency on auto ownership (and resulting in insurance, maintenance and fuel costs). Pedestrian pathway/footpaths also require relatively small infrastructure investments as compared to other types of transportation infrastructure and therefore, less environmental impact. The pedestrian pathway/footpath network system needs to be connected and continuous, just like roadways and railways.

17.5.2 *Supporting Indicator Requirements*

Percentage of road networks with safe usable pedestrian pathway/ footpath shall be calculated as length of usable footpath (numerator) per total road length (denominator). The result shall be expressed as the percentage by multiplying by 100.

17.5.3 *Data Source*

The data can be obtained from agencies engaged with planning for and maintenance of roads in the city.

17.6 Percentage of Road Network with Cycling Lanes (Supporting Indicator)

17.6.1 *General*

A transportation system that is conducive to bicycling can reap many benefits in terms of reduced traffic congestion and improved quality of life. Economic rewards both to the individual and to society are also realized through reduced health care costs and reduced dependency on auto ownership (and the resulting in insurance, maintenance and fuel costs). Bicycle lanes or pathways or tracks also require relatively small infrastructure investments as compared to other types of transportation infrastructure and comparatively less environmental impact.

17.6.2 *Supporting Indicator Requirements*

Percentage of road networks with cycling lanes or pathways or tracks shall be calculated as length of cycle tracks or pathways or lanes (numerator) per total road length (denominator). The result shall be expressed as the percentage by multiplying by 100.

Cycling lanes shall refer to part of a carriageway designated for cycles and distinguished from the rest of the road/carriageway by longitudinal road markings. Cycling pathways shall refer to independent road or part of a road designated for cycles and sign-posted as such. A cycling/cycle track is separated from other roads or other parts of the same road by structural means.

Bicycle lanes or paths that exist on both sides of the same road shall be counted separately.

17.6.3 *Data Source*

The data can be obtained from agencies engaged with planning for and maintenance of roads in the city.

17.7 Transportation Fatalities per 100 000 Population (Supporting Indicator)

17.7.1 *General*

Traffic accident rates and, specifically, fatality rates, can serve as indicators for the overall safety of the transportation system, the complexity and congestion of the roadway and transport network, the amount and effectiveness of traffic law enforcement, the quality of the transportation fleet (public and private), and the condition of the roads themselves. Traffic deaths represent the most severe type of traffic safety failure, allowing cities to focus on their most urgent traffic safety needs.

17.7.2 *Supporting Indicator Requirements*

Transportation fatalities per 100 000 population shall be calculated as the number of fatalities related to transportation of any kind within the city borders (numerator), divided by one 100 000th of the city's total population (denominator). The result shall be expressed as the number of transportation fatalities per 100 000 population.

The city shall include in this indicator deaths due to any transportation-related proximate causes in any mode of travel (automobile, public transport, walking, bicycling, etc). The city shall count any death directly related to a transportation incident within city limits, even if death does not occur at the site of the incident, but is directly attributable to the accident.

NOTE — Transportation fatalities are used here as a proxy for all transportation injuries. Whereas, many minor injuries are never reported, and thus cannot be measured. Deaths are almost always reported. It is also worth noting that differences in the quality of the roadway, the quality of motorized vehicles, and the nature of law enforcement can change the relationship between injury and fatality.

17.7.3 *Data Source*

The National Crime Records Bureau compiles state-wise information on accidental deaths and suicides in India (ADSI), including in respect of accidental traffic and road incidents, and publishes the same annually on its website. This data is generated by the police station houses and compiled at district and s tate levels. The ADSI also contains city-wise information in respect of 53 cities having population of over 10 lakh. For other cities, police station-wise data can be consolidated to generate city level information.

In addition, the local transport department office may also be a possible source for such information.

18 URBAN PLANNING

18.1 Percentage of Proposed Urban Development Area with in the Notified Master Plan for the City (Core Indicator)

18.1.1 *General*

Master plan notified under appropriate statute is a primary requirement for sustainable development of any city. Master plan for a city needs to be integrated with different hierarchy of plans that is zonal plans and local area plans.

Master plan should be based on the relevant statutes and the Urban and Regional Development Plan Formulation and Implementation (URDPFI) Guidelines and through a transparent and participatory process. The master plan shall have thematic sub-layers including drainage, sanitation, transit oriented development, disaster and climate resilience, housing, social infrastructure, urban renewal, etc.

NOTES

1 The master plan and all its sub-layers would have to be detailed on the cadastral map of the city and notified under the relevant statutes.

2 Master plan may have various nomenclatures as per different statutes for example, development plan.

18.1.2 *Core Indicator Requirements*

Percentage of Proposed Urban Development Area with in the notified master plan for the city shall be calculated as area of approved area proposed for urban development (in square kilometres) (numerator) divided by the total notified master plan area of the city (in square kilometres) (denominator). The result shall be expressed as percentage by multiplying by 100. In the absence of a notified master plan or development, this indicator shall be considered as zero.

18.1.3 *Data Source*

Data may be obtained from local bodies, Development Authority, Planning Authority and other similar authorities.

18.2 Green Area (hectares) per 100 000 Population (Core Indicator)

18.2.1 *General*

The amount of green area, natural and semi-natural, parks including biodiversity parks and other open space is an indicator of how much green space a city has. Green areas perform important environmental functions in an urban setting. They improve the urban climate, capture atmospheric pollutants, reduce storm runoff and improve quality of life by providing recreation for urban inhabitants.

18.2.2 *Core Indicator Requirements*

Green area (hectares) per 100 000 population shall be calculated as the total area (in hectares) of green in the city (numerator) divided by one 100 000th of the city's total population (denominator).

This indicator reflects green area that is publicly accessible as opposed to whether or not the green area is protected.

NOTE — Green area is broader than recreation space (*see* **12**).

18.2.3 *Data Source*

Information on green area should be obtained from recreation and parks departments, planning departments of the city municipal corporation, development authorities, and horticulture and forestry departments.

18.3 Areal Size of Informal Settlements as a Percentage of City Area (Supporting Indicator)

18.3.1 *General*

The size of informal settlements is an indicator of the extent of the challenges for the city in meeting shelter needs and demand. The UN statistics division has developed the following definitions which are used in this standard:

a) Areas where groups of housing units have been constructed on land that the occupants have no formal legal claim to.

b) Unplanned settlements and areas where housing is not in compliance with planning and building regulations (unauthorized housing).

NOTES

1 While many informal settlements also meet the definition of slum, the terms are not synonymous. Slums might exist in areas that do not meet the definition of informal settlements. Some informal settlements might have improved such that they do not meet the definition of slum.

2 Settlements characterized by irregular tenure, unplanned development and unauthorized shelter that is not in compliance with local building regulations are generally marginal and precarious, and affect social well-being, human health and economic development.

18.3.2 *Supporting Indicator Requirements*

The areal size of informal settlements as a percentage of city area shall be calculated as the area of informal settlements within the city boundary (in square kilometres) (numerator) divided by the city area in square kilometres (denominator). The result shall be expressed as the percentage by multiplying by 100.

Areas of informal settlements should be delineated using aerial photography and/or land-use maps and the area in square kilometres shall be calculated. Some low-cost and more sophisticated measurement methodologies have been developed. Once the areas have been identified on a map, the area in square kilometres should be calculated using a low-cost GIS (if available) or measuring devices.

18.3.3 *Data Sources*

Data should be gathered from the city planning department, together with departments knowledgeable about the city neighbourhoods. Local bodies and academic institutions may also be of assistance.

18.4 Jobs-Housing Ratio (Supporting Indicator)

18.4.1 *General*

Jobs shall refer to all types of full and part-time employment opportunities including those provided in the retail, industrial, government and office sectors located within the city boundaries. Housing shall refer to all dwelling units available for habitation.

This indicator does not take into account the informal sector, labour or employment, as unofficial employment is unaccounted for.

18.4.2 *Supporting Indicator Requirements*

The jobs-housing ratio shall be calculated as the total number of jobs (numerator) divided by the total number of dwelling units (denominator). The result shall be expressed as a whole number reflecting jobs to housing ratio within a city.

18.4.3 *Data Source*

Data on jobs in the organized sector available in the city could be collected from the register of profession tax maintained at city and other levels, District Labour Office, Local Bodies (Municipality, Panchayat, etc) and compiled suitably. In some instances, focussed surveys could also be called for.

Data on housing is available in the town/village Census Directory, which is published decennially and updated with the property data register of the local body concerned.

18.5 Urban Flooding (Core Indicator)

18.5.1 *General*

Rains are necessary for the wellbeing of human beings. Yet, they also make the habitats, in general, prone to flooding, particularly during the rainy season. As most of the rain-spells are short-lived, the flooding too is usually of shorter duration, yet it throws the life and economy of the citizens off the normal track. If and when the rains are of higher intensity, longer duration or more widespread, the impact on the habitats and the citizens is more devastating.

Cities must, therefore, identify their respective vulnerability to floods and, accordingly, undertake measures for both, adaptation and mitigation.

18.5.2 *Core Indicator Requirements*

The location of the flood prone areas and the highest flood levels, as also the rainfall data, as available in the historical records, particularly of the past 25 years need to identified and noted in the master plans. The master plan, in turn, should restrict the development activities in the flood prone areas. The development control regulations should also be aligned suitably.

The three identified aspects for streamlining sustainability in mitigating urban floods are:

a) Drainage management (Drng Mgmt);
b) Rain water harvesting (RWH); and
c) Rejuvenation and upkeep of urban water bodies (UWB).

It is advisable that the three listed components be quantified by their performance indices in the respective cities with their weighted values of importance.

Drng Mgmt Index (X) =

$$\frac{\text{Length of urban drains cleaned and de-silted before the monsoon}}{\text{Total length of surface drains in the city}}$$

RWH Index (Y) =

$$\frac{\text{No. of working RWH structures by annual audit}}{\text{Total number of samples audited in the reference year}}$$

UWB Index (Z) =

$$\frac{\text{Total area of water bodies conserved and rejuvenated in ref year}}{\text{Total area of all listed water bodies within the city limits}}$$

where

$$X + Y + Z = 1.$$

The fourth (additional) component, to define the availability of flood relief/shelter areas, could be the Disaster Management Index (DM Index), as follows:

DM Index =

$$\frac{\text{Flood relief and shelter area identified in the DM Plan (over HFL)}}{\text{Area of the city}}$$

Since, the matter of 'RWH' is subjective for city geo-morphology and hence can be selectively judged to be adopted for sustainability. It is proposed that the coefficient of the index so conceived may be kept variable between 0 and 1 while formulating the overall 'Urban Flooding' index.

Alongside, cities should prepare suitable action plans for drainage management, rainwater harvesting and proper upkeep of water bodies to offset the impact of flooding. Detailed advisories for the purpose have been issued under various documents such as the NDMA and URDPFI Guidelines, instructions contained in the advisories and policy documents of the state governments concerned, etc.

18.5.3 *Data Source*

The data relating to parameters for calculation of indices and about the flood prone areas, rainfall data and the highest flood levels, are available in the records of the city government, land revenue department, irrigation and flood control department and district statistical office. Geo-spatial maps available under BHUVAN and other sources can augment the database substantially.

18.6 Basic Services Proximity (Supporting Indicator)

18.6.1 *General*

The ease with which residents are able to access basic services is an important indicator of overall liveability and quality of life. This indicator measures the percentage of the population that lives within established proximity to basic services.

Basic services include food and everyday products, education centres, health centres, social centres, sports centres, cultural centres, entertainment centres, waste collection points, parks and playgrounds, etc.

18.6.2 *Supporting Indicator Requirements*

Basic service proximity shall be calculated as the number of inhabitants who live near at least one basic service (numerator) divided by the total population of the city (denominator).

For each type of basic service, the corresponding point layer is created by geo referencing the centres using a relational database join process that relates each centre with its address in the georeferenced municipal street guide.

Once all the layers are included in the GIS, proximity buffers are created for each of them with the help of the GIS buffer geoprocess.

Finally, the population that lives close to the basic service centres are those that are contained in each buffer layer, which can be obtained by a spatial selection.

NOTE — Proximity shall be considered as per the URDPFI guidelines.

18.6.3 *Data Source*

This information may be obtained from municipal authorities and authorized companies dealing with respective services.

19 WATER SUPPLY

19.1 Percentage of City Population with Potable Water Supply Service (Core Indicator)

19.1.1 *General*

The percentage of the city population served by a potable water supply is an indicator of city health and quality of life and a significant component of Sustainable Development Goals, Goal 6: Ensure Availability and Sustainable Management of Water and Sanitation for All.

19.1.2 *Core Indicator Requirements*

The percentage of city population with potable water supply service shall be calculated as the total number of people with potable water supply service (numerator) divided by total city population (denominator). The result shall then be multiplied by 100 and expressed as a percentage of city population serviced by a potable water supply service.

The total number of people with potable water supply service shall be calculated as the total number of households in the city connected to a potable water supply service multiplied by the current average household size for the city.

NOTE — Results will only indicate whether or not a house has access to potable water, not the quality of the delivery, the levels of loss, consumption or misuse, or the capacity of the sources to meet the demand.

Potable water shall refer to water that is treated or confirmed safe for human consumption. A potable water supply service shall refer to a service that delivers potable water through a pipe or similar duct that is connected to a network. If a house or group of houses has a 'mother' pipe connected either provisionally or permanently; it shall be considered to have access to potable water.

A house shall not be considered to have access to potable water when an individual house or group is served by a conduit system built with for example wood, bamboo, or rubber hose, connected directly to a river, well, or to another house.

19.1.3 *Data Source*

This information may be obtained from municipal authorities and the authorized water supply companies/agencies.

19.2 Total Domestic Water Consumption per Capita (litres/day) (Core Indicator)

19.2.1 *General*

Water consumption must be in harmony with water resources to be sustainable. This harmony may be achieved through improvements in water supply systems and changes in water consumption patterns. This indicator will need to be measured in terms of changes from year to year within a city within a range of rates due to the variability among cities. Consumption of water per person depends on the availability and price of water, the climate, and the uses to which water is customarily put by individuals (for example drinking, bathing, washing and gardening). In many cities, potable water supply is not constant and households rely on a few hours to tap the available water during the day. Water consumption is usually much higher in cities of higher income. A 24×7 water supply is to be aimed at, as this reduces per capita water consumption, besides providing social and economic benefits.

19.2.2 *Core Indicator Requirements*

The total domestic water consumption per capita shall be calculated as the total amount of the city's water consumption in litres per day for domestic use (numerator) divided by the total city population (denominator). The result shall be expressed as the total domestic water consumption per capita in litres per day.

Only water consumed for domestic purpose shall be taken into account. Water consumed for industrial and commercial purposes shall be excluded.

NOTE — A part of the water supplied is lost through leakage or illegal tapping. In cities with old and deteriorating water reticulation systems, a substantial proportion of piped water may be lost through cracks and flaws in pipes. It is therefore important to take this into account in the final consumption measure and if possible, with hundred percent metered connections and the quantity assessed on the basis of meter readings should be considered as quantity consumed.

19.2.3 *Data Source*

This information should be obtained from the municipalities and the authorized local operator(s) of water supply systems, which maintain records on water supplied, delivered, consumed and ultimately paid by the end-users for domestic purposes.

19.2.4 *Data Interpretation*

In interpreting this indicator, water consumption per capita should fall within a range that is sustainable for the climate of the city. A minimum benchmark should be established to meet public health and safety needs. Higher rates of per capita water consumption should show reductions approaching the minimum or sustainable consumption rates.

19.3 Total Water Consumption per Capita (litres/day) (Supporting Indicator)

19.3.1 *General*

Water consumption must be in harmony with water resources to be sustainable. This harmony may be achieved through improvements in water supply systems and changes in water consumption patterns. This indicator will need to be measured in terms of changes from year to year within a city within a range of rates due to the variability among cities. Consumption of water per person depends on the availability and price of water, the climate, and the uses to which water is customarily put by individuals (for example drinking, bathing, washing and gardening) and industrial, commercial and agricultural entities. In many cities, potable water supply is not constant and households rely on a few hours to tap the available water during the day. Water consumption is much higher in cities of higher income countries, as with most other forms of consumption.

19.3.2 *Supporting Indicator Requirements*

Total water consumption per capita (litres/day) shall be calculated as the total amount of the city's water consumption in litres per day (numerator) divided by the total city population (denominator). The result shall be expressed as the total water consumption per capita in litres/day.

19.3.3 *Data Source*

This information should be obtained from the main water supply companies, which maintain record on water supplied, delivered, consumed and ultimately paid by the end-users.

19.4 Total Water Supply through Metered Water Connections (Supporting Indicator)

19.4.1 *General*

Water for consumption as domestic, commercial, industrial or any other use, should be provided through water meter connection. Total quantity of water as summation of all meter readings should tally with the quantity of water produced and supplied. Water utility service will keep these records updated.

19.4.2 *Supporting Indicator Requirements*

Percentage of metered water connection shall be calculated as:

$$\frac{\text{Number of metered water connections} \times 100}{\text{Total number of water connections}}$$

19.4.3 *Data Source*

This information should be obtained from the local bodies and authorized water supply companies, which maintain record on water supplied, delivered, consumed and ultimately paid by the end-users.

19.5 Average Annual Hours of Water Service Interruption per Household (Supporting Indicator)

19.5.1 *General*

The reliability of water service to the user is the ultimate consideration in evaluating water supply, even though this reliability is based on both quantity and quality considerations and on interconnected systems of source water availability, water treatment and water distribution. This indicator determines whether a water supply system is reliable, or whether the water supply system needs fundamental or marginal improvements.

19.5.2 *Supporting Indicator Requirements*

The average annual hours of water service interruption per household shall be calculated by taking the total sum of hours of interruption multiplied by the number of households impacted (numerator), divided by the number of households (denominator). The result shall be expressed as the average annual hours of water service interruption per household. Incidents of complete shutoff, low flow restriction, boil water advisory, water main flushing and planned and unplanned interruptions shall be counted for this purpose.

This indicator shall exclude incidents where there is some reduction to the level of service but where normal activities (shower, washing machine, toilet flushing, etc) are still possible.

An 'unplanned interruption' is an interruption caused by a fault in the utility's system. A 'planned interruption' is an interruption for which the utility has provided at least 24 h advanced notification (or as otherwise prescribed by regulatory requirements).

19.5.3 *Data Source*

This information should be obtained from the local bodies and authorized water supply companies, which maintain record on water supplied, delivered, consumed and ultimately paid by the end-users.

19.5.4 *Data Interpretation*

Cities with older infrastructure, in areas with electric power interruptions, in areas of war or civil unrest, or in areas that are more susceptible to natural hazards such as earthquakes and extensive flooding will tend to report more incidents of service interruptions.

To facilitate comparison among cities, the number of interruptions can also be related to the hectares of water service area within the city.

19.6 Percentage of Water Loss (Unaccounted for Water) (Supporting Indicator)

19.6.1 *General*

Before reaching the users, a part of the water supplied might be lost through leakage or illegal tapping or water supplied for which no revenue is obtained. In cities with old and deteriorating water reticulation systems, a substantial proportion of piped water may be lost through cracks and flaws in pipes, for example, up to 30 percent of water is lost in this way in some cities.

19.6.2 *Supporting Indicator Requirements*

The percentage of water loss (unaccounted for water) shall be calculated as the volume of water supplied minus the volume of utilized water (numerator) divided by the total volume of water supplied (denominator). The result shall then be multiplied by 100 and expressed as a percentage.

The water loss includes actual water losses, for example leaking pipes, and billing losses, for example delivered through informal or illegal connection.

19.6.3 *Data Source*

This information should be obtained from local bodies and authorized water supply companies, which maintain record on water supplied, delivered, consumed.

19.7 Compliance Rate of Drinking Water Quality (Core Indicator)

19.7.1 *General*

Clean drinking water is a key determinant of human health. The compliance rate of drinking water quality is an indicator which can be used to determine the rate at which drinking water is kept to local regulations and standards to ensure no public health problems.

19.7.2 *Core Indicator Requirements*

Compliance rate of drinking water quality shall be calculated as the sum of the number of compliant tests multiplied by 100 (numerator) divided by the number of treated water quality tests carried out (denominator).

Compliant tests to be considered are aesthetic, microbiological, physical, chemical and radioactivity tests.

The compliance rate of drinking water quality indicates the percentage of the total number of treated water tests performed that comply with the applicable drinking water local regulations and standards on a quarterly basis to account for seasonal variations. The tests to be taken into account are the analyses performed on the distributed water for each parameter in relation with the local regulation and Indian Standard on drinking water quality.

19.7.3 *Data Source*

The local body and the specialized agencies, such as the Jal Boards/Corporations, handling water supply for the city.

ANNEX A

(*Foreword*)

SUMMARY TABLE OF CITY INDICATORS

A-1 The various indicators, described in this document, are presented in a summary form in the Table 1.

Table 1 Summary of City Indicators

(*Clause* A-1)

Sl No. (1)	Sector (2)	Core Indicator (3)	Supporting Indicator (4)
i)	Economy (*see* **4**)	a) Gross domestic product (GDP) for the city b) GDP Per capita c) City's unemployment rate d) Assessed value of commercial and industrial properties as a percentage of total assessed value of all properties	a) Gini coefficient b) Number of businesses per 100 000 population
ii)	Education (*see* **5**)	a) Percentage of female school-aged population enrolled in schools b) Percentage of students completing primary Education: Survival rate c) Percentage of students completing secondary Education: Survival rate d) Primary education student-teacher ratio	Percentage of school-aged population enrolled in schools
iii)	Energy (*see* **6**)	a) Percentage of total energy derived from renewable Sources, as a Share of the City's Total Energy Consumption b) Total electrical energy use per capita (kWh/year)	a) Total residential electrical energy use per capita (kWh/year) b) Average number of electrical interruptions per customer per year c) Average length of electrical interruptions (in hours) d) Percentage of transmission and distribution (T& D) losses
iv)	Environment (*see* **7**)	a) Fine Particulate matter ($PM_{2.5}$) concentration b) Particulate matter (PM_{10}) concentration c) Green house gas emissions measured in tonnes per capita d) Air quality index e) Noise pollution f) Quality of public water bodies	a) NO_2 (Nitrogen dioxide) concentration b) SO_2 (Sulphur dioxide) concentration c) O_3 (Ozone) concentration
v)	Finance (*see* **8**)	a) Debt service ratio (debt service expenditure as a percentage of municipality's own-source revenue)	a) Capital spending as a percentage of total expenditures b) Own-source revenue as a percentage of total revenues c) Tax collected as a percentage of tax billed
vi)	Governance (*see* **9**)	a) Voter participation in last municipal election (as a percentage of eligible voters) (core Indicator) b) Women as a percentage of total elected to city-level offices	a) Percentage of women employed in the city government workforce b) Number of convictions for corruption by city officials per 100 000 population c) Citizens' representation: number of local official elected to office per 100 000 population d) Number of registered voters as a percentage of the voting age population

Table 1 (*Continued*)

Sl No. (1)	Sector (2)	Core Indicator (3)	Supporting Indicator (4)
vii)	Health (*see* **10**)	a) Average life expectancy at birth b) Under age five mortality per 1 000 live births c) Number of in-patient hospital beds per 100 000 population d) Number of physicians per 100 000 population	a) Number of disabled persons per 100 000 population b) Number of nursing and midwifery personnel per 100 000 population c) Suicide rate per 100 000 population
viii)	Housing (*see* **11**)	Percentage of city population living in slums	a) Number of homeless per 100 000 population b) Percentage of households that exist without registered legal titles c) Percentage of slum dwellers having the right to tenure
ix)	Recreation (*see* **12**)	-	a) Square metres of public indoor recreation space per capita b) Square metres of public outdoor recreation space per capita c) Number of art galleries, museums, cultural centres per 100 000 population
x)	Safety (*see* **13**)	a) Number of police personnel per 100 000 population b) Number of homicides per 100 000 population c) Crimes against women per 100 000 population d) Number of professional firefighters per 100 000 population e) Number of fire related deaths per 100 000 population f) Number of natural disaster related deaths per 100 000 population	a) Response time for police department from initial call b) Violent crime rate per 100 000 population c) Number of volunteer and part-time firefighters per 100 000 population d) Response time for emergency response Services from initial call e) Response time for Fire Department from initial call f) Number of buildings with fire safety clearance per 10 000 buildings
xi)	Sewerage and Sanitation (*see* **14**)	a) Percentage of city population having access to sanitary toilet facilities b) Percentage of city population served by sewage (wastewater) collection c) Percentage of the city's wastewater that has received no treatment d) Percentage of the city's wastewater receiving primary treatment	a) Percentage of the city's wastewater receiving secondary treatment b) Percentage of the city's wastewater that is being recycled and reused
xii)	Solid Waste (*see* **15**)	a) Percentage of city population covered with regular solid waste collection b) Total collected municipal solid waste per capita per year c) Percentage of the city's solid waste that is recycled	a) Percentage of the city's solid waste that is disposed of in a sanitary landfill b) Percentage of the city's solid waste that is disposed of in an incinerator c) Percentage of the city's solid waste that is burned openly d) Percentage of the city's solid waste that is disposed off in an open dump e) Percentage of the city's solid waste that is disposed of by other means
xiii)	Tele communication and Innovation (*see* **16**)	a) Number of internet connections per 100 000 population b) Percentage of households with computer c) Cyber security readiness for ICT infrastructure and online citizen service delivery	a) Percentage of households with internet access b) Number of new patents per 100 000 population per year

Table 1 (*Concluded*)

Sl No. (1)	Sector (2)	Core Indicator (3)	Supporting Indicator (4)
xiv)	Transportation (*see* **17**)	a) Kilometres of high capacity public transport system per 100 000 population b) Kilometres of light passenger public transport system per 100 000 population c) Annual number of public transport trips per capita	a) Percentage Share of electric vehicles as part of total vehicles in a city b) Percentage of road network with usable pedestrian pathway/footpath network c) Percentage of road network with cycling lanes d) Transportation fatalities per 100 000 population
xv)	Urban Planning (*see* **18**)	a) Notified master plan for integrated land use b) Green area (hectares) per 100 000 population c) Urban flooding	a) Areal size of informal settlements as a percentage of city area b) Jobs-housing ratio c) Basic services proximity
xvi)	Water Supply (*see* **19**)	a) Percentage of city population with potable water supply service b) Total domestic water consumption per capita (litres/day)	a) Total water consumption per capita (litres/day) b) Total water supply through metered water connections c) Average annual hours of water service interruption per household d) Percentage of water loss (unaccounted for water)
TOTAL	**16**	**48**	**52**

ANNEX B

(*Foreword*)

CITY PROFILE INDICATORS

B-1 A list of profile indicators, which provide basic statistics and background information about the city, is given in the Table 2. This list contains the core minimum information that should be projected. It can be augmented with additional information that a city would like to showcase.

Table 2 City Profile Indicators

(*Clause* B-1)

Sl No. (1)	**Theme** (2)	**Indicator** (3)
i)	People	a) Total city population
		b) Population density (per square kilometre)
		c) Percentage of country's population
		d) Percentage of population that are children (0-14 year)
		e) Percentage of population that are youth (15-24 year)
		f) Percentage of population that are adult (25-64 year)
		g) Percentage of population that are senior citizens (65+ year)
		h) Male to female ratio (number of males per 100 females)
		j) Annual population change
		k) Population dependency ratio (that is the number of children (0-14 years old) and older persons (65 years or over) to the working-age population (15-64 years old)
		m) Percentage of population that are foreign born
		n) Percentage of population that are new immigrants
		o) Percentage of residents who are not registered voters in the city
ii)	Housing	a) Total number of households
		b) Total number of occupied dwelling units
		c) Persons per unit
		d) Dwelling density (per square kilometre)
		e) Total number of vacant houses (vacant for last one year or more)
iii)	Economy	a) Average household income (₹ per annum)
		b) Annual inflation rate based on average of last 5 years
		c) Total number of bank branches
		d) Number of factories registered under the *Factories Act*
		e) Availability of airport for passenger services
		f) Availability of railway station for passenger and goods services
		g) Availability of number of national highways connecting the City with rest of the region/ nation
		h) Availability of number of national water ways for goods transportation
		j) City product as a percentage of country's GDP
		k) Employment percentage change based on the last 5 years
iv)	Government	a) Type of government (for example, municipality, cantonment board, industrial area authority, regional authority, etc)
		b) Gross operating budget (₹ in crore)
		c) Gross operating budget per capita (₹)
v)	Geography and Climate	a) Region
		b) Climate type
		c) Land area (square kilometres)
		d) Area under natural resources, such as forests, water bodies, hills/hillocks, natural drainage systems and changes in past 5 years
		e) Percentage of non-residential area (square kilometres)
		f) Number of native species
		g) Annual average temperature (C°)
		h) Average annual rain (mm)
		j) Average annual snowfall (cm)
		k) Is the ground water receding?
		m) Area and population experiencing natural hazard risks during past 5 years

ANNEX C

(*Foreword*)

COMMITTEE COMPOSITION

Smart Cities Sectional Committee, CED 59

Organization	*Representative(s)*
In Personal Capacity, (*G-1602, Pioneer Park, Sector-61, Gurugram 122 001*)	Dr Sudhir Krishna (***Chairman***)
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ALL India Institute of Local Self Government, Mumbai	Shri Ramnath Jha Shri Advait Aundhkar (*Alternate*)
Building Materials and Technology Promotion Council, New Delhi	Shri J. K. Prasad
Builders Association of India, New Delhi	Shri Dharmesh Awasthi Shri Arun Sahai (*Alternate*)
Confederation of Indian Industry, New Delhi	Shri Virender Singh
Confederation of Real Estate Developers' Association of India, New Delhi	Representative
Corporation of Chennai, Chennai	Shri B. V. Babu Shri S. Sudhakar (*Alternate*)
Delhi Development Authority, New Delhi	Shri S. P. Pathak Shri Rajesh Kumar Jain (*Alternate*)
Delhi-Mumbai Industrial Corridor Development Corporation Ltd, Mumbai	Chairman
Department of Telecommunications, Ministry of Communications, New Delhi	Shri S. P. Mohapatra Shri Anand Agrawal (*Alternate*)
Federation of Indian Chambers of Commerce & Industry, New Delhi	Shri Jayant Kohale Ms Mousumi Roy (*Alternate*)
Gujarat International Finance, Tec-City Company Ltd, Ghandinagar	Shri Loveleen Garg
Indian Concrete Institute, Chennai	Shri K. P. Abraham
Indian Green Building Congress, New Delhi	Dr Prem C. Jain Ms Sheetal Rakheja (*Alternate*)
Indian Institute of Technology, Kharagpur, Kharagpur	Prof Uttam K. Banerjee
Institute of Town Planners, India, New Delhi	Shri B. C. Datta Prof Kulshreshtha (*Alternate*)
Karki Associates, New Delhi	Shri Rajnish Karki
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Ministry of Consumer Affairs, Food & Public Distribution, New Delhi	Director (BIS) Under Secretary (BIS) (*Alternate*)
Ministry of Drinking Water & Sanitation, New Delhi	Shri D. Rajshekhar Shri G. Balasubramaniyam (*Alternate*)

Organization	*Representative(s)*
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Ministry of Electronics & Information Technology, New Delhi	Ms Kavita Bhatia Shri Mayank (*Alternate*)
Ministry of Housing & Urban Affairs, New Delhi	Shri Kunal Kumar
Ministry of New & Renewable Energy, New Delhi	Dr A. K. Tripathi Dr G. Prasad (*Alternate*)
Ministry of Panchayati Raj, New Delhi	Joint Secretary
Ministry of Power, New Delhi	Secretary
Ministry of Statistics & Programme Implementation, New Delhi	Ms R. Savithri Dr P. C. Mishra (*Alternate*)
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Ministry of Transport, New Delhi	Representative
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Shapoorji Pallonji Ltd, Mumbai	Shri Venkatesh Gopalkrishnan
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WRI India, New Delhi	Ms Prerna Mehta

(*Continued from second cover*)

for city level database. It should, however, be possible for the city bodies to secure the city level data from these bodies. It would also be desirable for the data collecting bodies to tabulate the survey data at local levels, such as the ward, village and city and publish the same on their portals in a format that would allow the users collate and generate results for higher levels, such as metropolitan region or district.

Cities should give attention to development of city-level database on real-time basis by digitizing their services. For instance, registration of the birth of a child should automatically lead to updating the statistics of city's population; issue of occupancy certificate (OC) for a building should lead to automatic updating the database on the number of buildings in the city and if the OC was given for a commercial building then the city data on city data on number of commercial buildings should get updated automatically.

Cities would need to maintain their statistical information online, for which the Ministry of Statistics and Programme Implementation has developed a framework titled 'Basic Statistics for Local Level Development (BSLLD)'. The database should be dynamically linked with the city's business processes so as to update it on a real-time basis. Such database would facilitate immensely in adoption of these standards in developing Master Plans for integrated land-use and sector-specific plans, such as city mobility plan, city sanitation plan, city housing plan, etc, as also for development of projects for specific sectors.

While the data from the periodic surveys by national and state bodies, such as the decennial census of population and amenities or the five-yearly economic census, etc, would provide the benchmark statistics, the online BSLLD based profile information system suggested above would provide a framework for measuring the progress achieved by the city in different aspects.

A list of profile indicators, which provide basic statistics and background information about the city is given in Annex B. Profile indicators are used as an informative reference about the city and can help cities determine which other cities could be of interest for peer comparisons.

The composition of the Committee responsible for the formulation of this standard is given in Annex C.

While formulating this Indian Standard, necessary guidance has been derived from ISO 37120 : 2018 'Sustainable development of communities: Indicators for city services and quality of life', duly modulated by the documents notified by various statutory and other authorized agencies in India.

For the purpose of deciding whether a particular requirement of this standard is compiled with the final value, observed or calculated, expressing the result of a test or analysis shall be rounded off in accordance with IS 2 : 1960 'Rules for rounding off numerical values (*revised*)'. The number of significant places retained in the rounded off value should be the same as that specified value in this standard.

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